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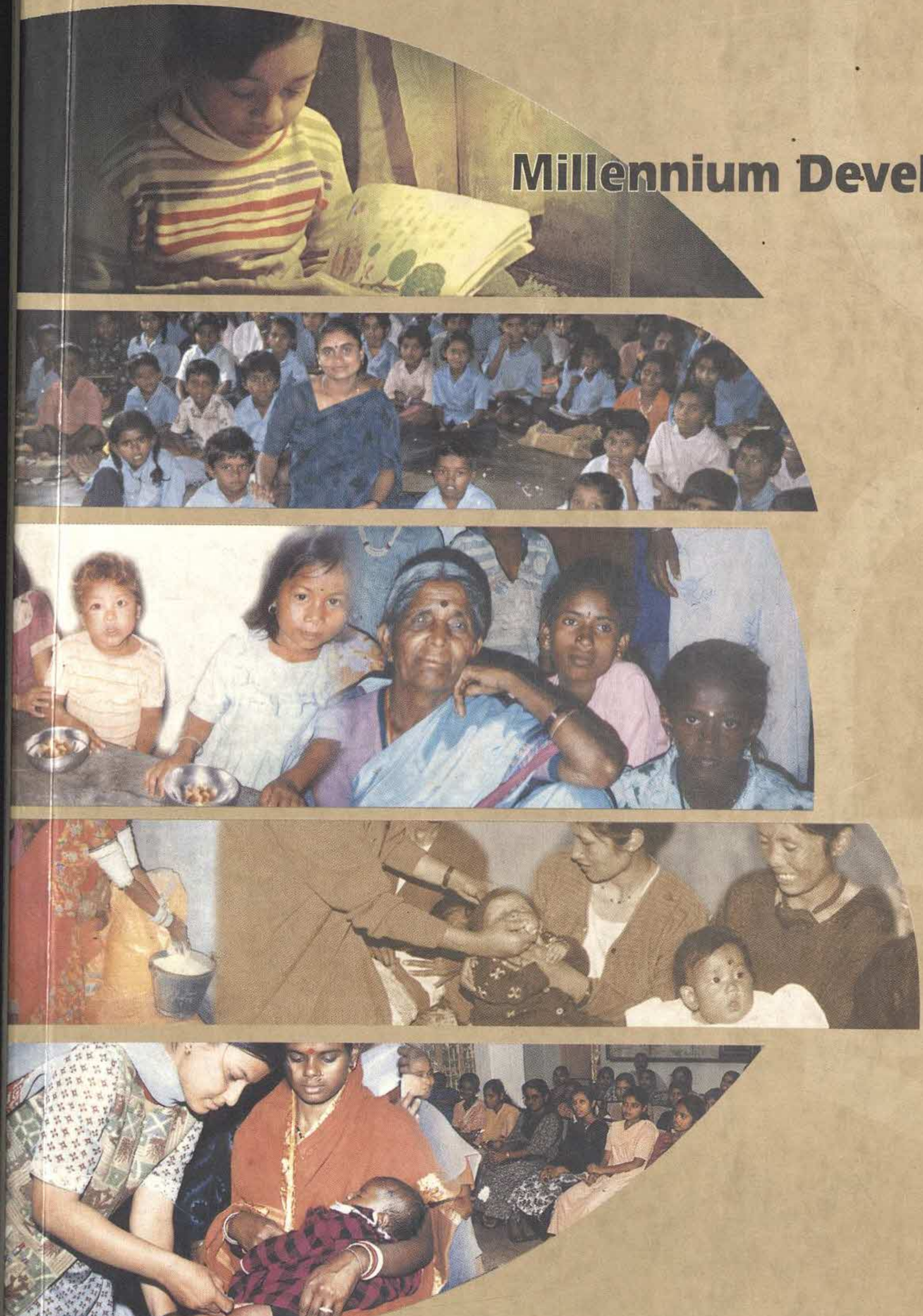
Attaining the Millennium Development Goals in India

REDUCING INFANT MORTALITY, CHILD MALNUTRITION, GENDER DISPARITIES AND HUNGER-POVERTY AND INCREASING SCHOOL ENROLLMENT AND COMPLETION

Anil B. Deolalikar



THE WORLD BANK

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IN INDIA

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ANIL B. DEOLALIKAR

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Abbreviations and Acronyms

AP	-	Andhra Pradesh
GOI	-	Government of India
GSDP	-	Gross State Domestic Product
HD	-	Human Development
IMR	-	Infant Mortality Rate
MD	-	Millennium Development
MDG	-	Millennium Development Goal
MMR	-	Maternal Mortality Rate
MP	-	Madhya Pradesh
NFHS	-	National Family and Health Survey
NSS	-	National Sample Survey
NSSO	-	National Sample Survey Organization
SRS	-	Sample Registration Surveys
U5MR	-	Under-Five Mortality Rate
UP	-	Uttar Pradesh

This report was prepared by Anil B. Deolalikar, who was Lead Economist (SASHD) until September 2003 and currently Consultant (SASHD), under the overall guidance of Charles Griffin, who was Sector Director (SASHD) at the time of the report preparation, and Michael Carter, Country Director for India (SACIN). Inputs from Peeyush Bajpai, Laveesh Bhandari, Amaresh Dubey, and Mehtab ul-Azam (consultants) and from V. Selvaraju and V. Sundararaman (SASHD) are gratefully acknowledged. The peer reviewers were Jere Behrman, Raghav Gaiha, Robert M. Hecht, Raghbendra Jha, and Maureen Lewis. Sudesh Ponnappa and Karthika Nair (SASHD) provided very helpful team assistance. Comments on an earlier draft from a technical review committee headed by Shanta Devarajan, Chief Economist (SAR), were helpful in preparing the current version of the report. This report has been shared with the Government of India, but does not necessarily bear their approval for all its contents, especially where the Bank has stated its judgments, opinions, and conclusions.

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Preface

The Millennium Development Goals commit the international community to a comprehensive vision of development — one that places human development as the centerpiece of social and economic progress and puts great value on global partnerships for development. Since 2000, when the MDGs were ratified at the United Nations Millennium Summit, the goals have been widely accepted as a yardstick for measuring development progress across countries.

However, discussion of many of the issues relating to the MDGs — namely, the likelihood and costs of attaining them — has remained at a global level. There have been relatively few country studies that either have examined sub-national variations in the likelihood of attaining the MDGs or have analyzed, in any detail, the different factors that are likely to speed the attainment of the MDGs.

This is one of the first detailed country reports on the MDGs done by the World Bank. A major contribution of the report is its focus on inter-state and inter-regional variations in India's development progress. The report argues forcefully that India's performance on the MDGs will hinge critically on the MDG performance of its poor states, which not only have the worst human development outcomes in the country but which also account for a large and increasing proportion of India's population. The report goes beyond mere description; it examines the association between the MD indicators and various policy and behavioral variables. Using these associations, it undertakes simulations of the likely trajectory of the MD indicators in the poor states through 2015 under possible scenarios.

Naturally, quantitative analysis of the type presented in this report is subject to many limitations. There are issues of data quality, statistical inference, and omission of important 'qualitative' variables, such as governance and accountability. It is therefore important to view this report not as the final and complete word of India's prospects at attaining the MDGs, but instead as one of many contributions to a broader debate on what it will take for India, and its many states and regions, to attain the MDGs. In going forward, it will be important to complement the findings of this report with other methodological approaches. Indeed, the World Bank commissioned a number of case studies of innovative, on-the-ground interventions throughout India that have attempted to influence MD outcomes. These case studies and this report were discussed extensively at an MDG conference held in New Delhi in June 2004.

We would like to express our gratitude to the many experts from government and non-government agencies, other international organizations, and civil society who provided their time and insights generously during the preparation of this report.

Michael F. Carter
Country Director
World Bank India Office

Executive Summary

Introduction

Since the launch of the Millennium Development Goals (MDGs) at the Millennium Summit in New York in September 2000, the MDGs have become the most widely accepted yardstick of development efforts by governments, donors and NGOs. The MDGs are a set of numerical and time-bound targets related to key achievements in human development. They include halving income-poverty and hunger, achieving universal primary education and gender equality, reducing infant and child mortality by two-thirds and maternal mortality by three-quarters, reversing the spread of HIV/AIDS and other communicable diseases, and halving the proportion of people without access to safe water. These targets are to be achieved by 2015, from their levels in 1990 (United Nations 2000).

Almost all the countries in the world, including India, have committed themselves to attaining the targets embodied in the Millennium Declaration by 2015. Unfortunately, there is little understanding of whether India will be able to attain all of the MDGs, and whether there are some MDGs that India will be able to attain. here is even less understanding of what it will take — by way of economic growth, infrastructural investments, and sectoral interventions — to attain the different MDGs. Further, this report argues the importance of disaggregating the MDGs for India, given the very large geographical and socio-economic variations in millennium development (MD) indicators across the country.

This report focuses on the attainment of five major human development-related MDGs by sub-national units in India — child and infant mortality, child malnutrition, schooling enrollment and completion, gender disparities in schooling, and hunger-poverty (as reflected by inadequate calorie intake). The selection of these MDGs for detailed analysis was based in large part on the availability of reliable sub-national data.

The basic premise of this report is that there are large disparities in the past performance as well as future prospects of different sub-national units in terms of the MD indicators. India cannot hope to attain the MDGs without significant progress in the MD indicators in its poorest states — Bihar, Orissa, Uttar Pradesh, Madhya Pradesh, and Rajasthan. These states not only currently account for a large proportion of the country's population, but, because of more rapid population growth, will account for an even larger share of the country's population in 2015. The report attempts to identify the specific interventions that will improve substantially the likelihood of the poor states attaining the MDGs.

While one of the main objectives of this report is to present a disaggregated analysis of MDGs, availability of data limits the extent to which the analysis can be fully disaggregated. In addition, the simulations undertaken in this report are based on empirical analysis of survey data, which typically relies on many assumptions about data quality and measurement, inferences of causality between variables, and potential biases of statistical and econometric estimates. It is therefore important to note at the outset that, while the results and simulations presented in this report may give an impression of precision, they are not that. They should be treated as being indicative of possible broad trends, and could usefully be complemented with other analyses using different methodological approaches. As long as the results are used with this understanding, they can be helpful in 'rough-order' planning for MDG attainment.

The conclusion of this report is that attainment of the MDGs (at least the five specific goals considered in this report) will remain challenging in the poor states of India. Despite the grim situation, however, the poor states should be able to meet the MDGs relating to infant mortality, child malnutrition, and hunger-poverty with a combination of interventions, including sector-specific interventions (such as nutrition supplementation and immunization), economic growth, improved coverage of infrastructure, and wide-ranging reforms in the institutions of service delivery. However, attaining the education goals will require considerably more effort. This report concludes that while substantial progress could be made by the poor states on increasing the rates of net primary enrollment and primary completion, it will be challenging for them to attain the education-related MDGs of 100% net primary enrollment and 100% primary completion, in large part because of the enormous gap between their current rates of net primary enrollment and completion (only 50% and 54%, respectively) and the MD targets. The simulation analysis also suggests that complete elimination of the gender gap in primary and secondary enrollment, called for by the MDGs, will be a very challenging goal to attain.

Infant and Child Mortality

The millennium development goal is to reduce infant and child mortality by two-thirds between 1990 and 2015. For India, this would imply a reduction of the infant mortality rate (IMR) to 27 and of the under-five mortality rate (U5MR) to 32 by 2015.

Despite infant mortality having declined impressively in India — from 130-140 infant deaths per 1,000 live births in the early 1970s to 68 in 2000 — the absolute levels of infant and child mortality are still too high (about 68 infant and 95 child deaths per 1,000 live births in 1998-99). Nearly 1¾ million children die each year in the country before reaching the age of one. In addition, India compares poorly on the pace of IMR reduction to several other countries in South and Southeast Asia, including Bangladesh.

There are large inter-state and intra-state variations in IMR in the country, with the IMR ranging from a low of 14 for Kerala to a high of 96 for Orissa. The rate of progress on IMR reduction has also varied significantly across sub-national units. States such as Bihar and U.P., which had among the highest IMRs in the country in 1981, were among the top performers in IMR reduction over the period 1980-99. On the other hand, Andhra Pradesh and Karnataka had the slowest rate of IMR decline over the two decades. In general, there was some convergence in IMRs, so that inter-state disparity in infant mortality decreased between 1981 and 2000.

An interesting feature of infant deaths in India is that they are concentrated in just a few states. The NFHS-2 data are also suggestive of infant deaths being heavily concentrated in a relatively small number of districts and villages in the country. For instance, during 1994-99, a fifth of the country's districts and villages accounted for one-half of all infant deaths in the country. While these numbers are not precise (owing to the difficulty of measuring infant mortality for small samples), they suggest that infant mortality could be brought down considerably by first identifying and then targeting mortality-reducing interventions to those districts and villages with the largest number of infant deaths in the country.

Econometric analysis of state-level data on IMRs over the last two decades shows some evidence, although not persistent, of a significant inverse association between infant mortality and government health expenditure across states. In addition, some of the more general econometric specifications suggest a stronger inverse association for the very poor states than for the non-poor states. This may simply reflect the fact that states with high infant mortality rates tend to have a larger proportion of infant deaths occurring during the post-neonatal (as opposed to the neo-natal) period, and these deaths are more easily averted by the typical (and relatively inexpensive) child survival interventions, such as child immunizations and oral rehydration therapy. On the other hand, reduction of neo-natal deaths, which are relatively more common in the better-off, low-mortality states, typically requires more expensive interventions, such as professionally-attended deliveries or deliveries in institutions as well as post-delivery and emergency hospital-based care.[1]

The results also indicate significant associations between infant mortality on the one hand and female literacy and per capita GSDP on the other hand. Per capita income and female literacy have a significant interactive association with infant mortality such that the inverse association between infant mortality and female literacy is stronger at higher income levels than at lower income levels. This suggests that female literacy and the level of development in a state complement (rather than substitute for) each other in terms of their association with infant mortality.

There is significant gender disparity in the likelihood of children dying in India. While the probability of death is greater for males than for females until age one, the reverse is true from ages one to five. Parental neglect toward girls — symptomatic of the generally low social status of women — appears to be an important cause of the gender disparity in child mortality. Girls are less likely to receive adequate food allocations and medical treatment for their illnesses than boys.

In addition, this report finds strong inverse associations between infant mortality and maternal education, access to roads, regular supply of electricity and sanitation, and coverage of tetanus immunization and antenatal care among women. The empirical results suggest that if the poor states were simply brought up to the national averages in terms of coverage of sanitation, road access, electricity, antenatal care, tetanus immunization, female schooling, and public spending on health and family welfare per capita, the cumulative reduction in the infant mortality rate in the poor states would be of the order of 12 infant deaths per 1,000 live births (or 16%). If the magnitude of the proposed interventions were scaled up so as to bring the poor states to the mean level of the non-poor states, the reduction in infant mortality rate in the poor states would be greater — about 36.5 infant deaths per 1,000 live births (or 48%). It thus appears that infant mortality in the poor states could decline substantially with a combination of interventions.

Finally, we undertake simulations of the reduction in the infant mortality rate in the poor states to 2015 under the assumption that the fore-mentioned interventions are pursued gradually between now and 2015. The simulation results suggest that the two interventions most strongly associated with infant mortality reduction in the poor states are increased schooling of mothers and additional public spending on health and family welfare. With all of the interventions, the infant mortality rate in the poor states is projected to decline from 75 infant deaths per 1,000 live births to a level of 29 by 2015 — just slightly below the MD goal. This suggests that the infant mortality MDG will be challenging but attainable in the poor states of the country with a combination of mortality-reducing interventions pursued simultaneously.

The finding about the association between increased government health expenditure and infant mortality needs two qualifications. First, merely increasing health spending will not be enough; the composition, quality, and effectiveness of public spending is as important as raising its quantity. This is especially true of the poorer states in India, which are plagued with the most serious problems of governance and service delivery in the health (and other) sectors. Serious attention thus needs to be paid to making government health services work, especially for the poor. As the *World Development Report 2004* points out, this is a complex and difficult task that entails creation of the right institutions and incentives in the system to improve service delivery, such as devolving responsibility for service delivery to local governments and communities, contracting out certain types of service delivery to the non-government sector, and empowering consumers to demand better services from government health facilities.

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[1] Although neo-natal mortality reduction typically requires hospital-based care, it is possible to provide a relatively inexpensive package of home-based neonatal services, as shown by a highly-successful field trial in Maharashtra in 1995-98 (see Box II.1 for a detailed description of the intervention).

Second, the finding that public spending on health is associated with infant mortality reduction in the poor states is of little use to policy makers. Identifying the type of health interventions on which to spend resources in the poor states is of much greater policy interest. The evidence in this report, as well as the results of previous studies, suggest that a package consisting of expanded child and maternal immunization, antenatal care coverage, nutritional supplementation (including promotion of exclusive breast-feeding), and home-based neonatal services (including treatment of pneumonia) is likely to be a high-impact intervention strategy.

Child Malnutrition

The millennium development goal is to reduce the percentage of underweight children by one-half between 1990 and 2015, which would imply, for India, a reduction in the child underweight rate from 54.8% in 1990 to 27.4% in 2015.

Child malnutrition rates in India are extraordinarily high. The NFHS-2 indicates that nearly one-half of children aged 0-35 months were underweight or stunted in 1998-99.[2] About 18-23 percent of children are severely underweight or stunted in the sense of being more than three standard deviations below the relevant NCHS standards. A comparison of data from two rounds of the NFHS shows a modest decline of about 11% (from a rate of 52.7% to 47%) between 1992-93 and 1998-99. This is a much smaller decline than in neighboring Bangladesh, where underweight rates fell from 68% in 1992 to 51% in 2000.

An average child underweight rate of 47% masks wide variations in child malnutrition across states. Child underweight rates vary from a low of 24-28% in the Northeastern states and Kerala to 51-55% in the states of Bihar, Rajasthan, Uttar Pradesh, Madhya Pradesh, and Orissa Likewise, the decline in child underweight rates over time has also varied greatly across states. In Punjab, for instance, the child underweight rate fell at an annual rate of 7.6% between 1992-93 and 1998-99, while Rajasthan saw an increase of 2% per annum in the child underweight rate during the same period.

Sub-state variation in the child underweight rate is also very large, with the rate ranging from a low of 11% in the Hills region of Assam to a high of 60% in Chhattisgarh. More than a third of the regions in the country have underweight rates of 50% or greater, showing the pervasiveness of child malnutrition in India. Even more worrying is the finding that more than a quarter of all the regions in the country experienced an increase in child underweight rates. These regions are scattered around the country — in the poor states (Jharkhand, Bihar, Orissa, and Uttar Pradesh) but also in the more prosperous states, such as Gujarat, Maharashtra, and Haryana.

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[2] As in the literature, a child is considered underweight when his or her weight-for-age is more than two standard deviations below the NCHS reference weight. A child is stunted when his or her height-for-age is more than two standard deviations below the NCHS reference. Severe underweight and stunting occur when the relevant nutrition indicator is more than three standard deviations below the NCHS reference.

Like infant deaths, underweight children are also concentrated geographically in a relatively small number of districts and villages. A mere 10% of districts and villages account for 27-28% — and a quarter of districts and villages account for more than half — of all the underweight children in the country.

Several factors contribute to the high rates of child malnutrition in India: poor maternal nutrition leading to low birth weights, which in turn increases the risk of child malnutrition; poor infant feeding practices (such as waiting for a day or longer after birth before breast-feeding an infant, discarding the first breast milk or *colostrum*, early termination of exclusive breast-feeding and introduction of supplementary feeding); and high rates of diarrheal and other infections.

Much of the economic variation in child underweight rates across economic groups occurs between the bottom four consumption quintiles and the top quintile, with little variation among the poorest 80% of the population. However, even the richest quintile shows relatively high child underweight rates (about 30%). The fact that nearly a third of the top consumption quintile in the country — a group that is likely to have good economic access to food — is malnourished suggests that cultural and social factors have an important role to play in determining child malnutrition in India. This is also consistent with the finding that the child underweight rate is relatively high in prosperous states such as Gujarat and Maharashtra.

The other correlates of child malnutrition are affiliation to socially-disadvantaged groups (such as Scheduled Castes and Tribes and Other Backward Castes), maternal age and education, and birth order (with higher birth order girls having a greater risk of malnutrition than higher birth order boys). In addition, infrastructural variables — access to toilets, regular electricity, and good roads — are significantly associated with reduced child malnutrition.

Much of the public spending on child nutrition in India takes place on the Integrated Child Development Services program. This program consists of *anganwadi* centers (AWCs) in each village, typically staffed by a village woman with 5-8 years of schooling and an assistant, whose functions are to provide growth monitoring, pre-school education and nutritional supplementation to targeted children aged 0-6 years in the village. Although the program covers all the villages in the country, recent surveys from a few states suggest that relatively few (about 10-30%) children aged 0-6 years in states such as Uttar Pradesh, Madhya Pradesh, and Rajasthan regularly attend the AWCs in their community. This may be because the amount of food supplementation provided to children is meager or irregular or both.

There are large disparities in public expenditure on nutrition across states. Poor, high-malnutrition states like Bihar, Uttar Pradesh, Madhya Pradesh, and Rajasthan spend only Rs. 30-50 on nutrition programs per child 0-6, while Gujarat, Punjab, and Haryana spend Rs. 90-100. Tamil Nadu's expenditure is close to Rs. 170, while spending in the Northeastern states is above Rs. 500.

Simulations based on multivariate analysis of child underweight rates using unit record data show that if the poor states were brought up to the national average in terms of coverage of sanitation, road access, electricity, medical attention at the time of delivery, adult female schooling, household income (consumption), and public spending on nutrition programs per child, the cumulative reduction in the child underweight rate in these states would be of the order of about 8 percentage points (or 15%). If the magnitude of the proposed interventions were scaled up, so as to bring the poor states to the average level prevailing in the non-poor states, the cumulative reduction in the child underweight rate in the poor states would be 21 percentage points or 38%. These are large reductions in child malnutrition. Indeed, the simulations indicate that, together, the proposed interventions are associated with a reduction of 25 percentage points in the child underweight rate in the poor states — enough for them to attain the MD goal.

As noted earlier, a great deal of the spending on nutrition in India takes place via the ICDS program. The NFHS -1 data suggests that, after controlling for other factors (including household living standards and maternal education), the presence of an ICDS *anganwadi* center in a village is associated with a reduction of about 5% in the child underweight rate, but only for boys. A 5% reduction in underweight rates is consistent with anecdotal evidence that food rations distributed by most *anganwadi* centers in the country are limited, infrequent, and often irregular. However, the finding that all of the positive nutritional benefits of *anganwadi* centers accrue to boys, not girls, is surprising. It could reflect that parents tend to selectively bring their boys, but not their girls, for supplementary feeding at the center. Or it could indicate that *anganwadi* workers or helpers provide a larger allocation of food to boys than girls. This is an issue that merits further exploration.

Primary Schooling

The millennium development goal is to ensure that, by 2015, all children are in school, the net primary enrollment ratio is 100%, and that all the pupils entering grade 1 are retained until grade 5 (typically the last year of primary school).

India has made rapid strides in education during the last 4-5 decades. The gross primary enrollment rate, which was only 43% in 1950-51, reached 100% by 1990-91, and has fallen slightly since then. An average gross primary enrollment rate of 95% for the country in 1999-200 for the country masks wide variations across states. Gross primary enrollment rates vary from a low of 65% in Uttar Pradesh to a high of 139% in Sikkim.

However, as in other countries, gross enrollment rates obtained from school administrative records differ significantly from household survey-based estimates of enrollment. Data from the 55th round of the NSS indicate a gross primary enrollment rate of 61% and a net rate of only 52.5% in 1999-2000. The data also show that, even at the peak attendance ages of 9-11 years, nearly 15% of the population does not attend school. This is indicative of a large class of children who never attend school.

In addition, there are large differences across states in the primary attendance rate. Attendance rates for the age group 6-11 exceed 90% in 9 states — Kerala, Tamil Nadu, Maharashtra, Goa, Himachal Pradesh, and the states of the Northeast. At the other end, the primary attendance rates are only 75% or lower in Bihar, Orissa, Rajasthan, Uttar Pradesh, and Madhya Pradesh. With only 53% of children aged 6-11 attending school, Bihar ranks as the poorest-performing state on school attendance in the country.

There is a large discrepancy between the age-specific and the net primary attendance rate in all the states. Even in the states having high attendance rates among 6-11 year olds, the net primary attendance rate is significantly lower. In Bihar, a mere 28% of children aged 6-11 attend primary school!

Sub-state differences in the net primary school attendance rate are very large as well. Six regions in the country — largely in Bihar, Jharkhand, Orissa, and Manipur — had a net primary attendance rate of less than [illegible]0% in 1999-2000. Sixteen regions, out of a total of 78 regions, had a net primary attendance rate of less than 50%. Even more discouraging is the fact that 29 regions in the country, out of a total of 77 regions, either did not see an improvement in their net primary attendance rate between 1993-94 and 1999-2000, or saw it decline.

Analysis of state-level data over the period 1980-99 generally seems to show a significant positive association between the gross primary enrollment rate and per-child government expenditure on elementary education across states, even after controlling for per capita income and adult female literacy. In addition, depending upon different specifications, the positive association between the gross primary enrollment rate and government elementary school expenditure is observed to be weaker in the non-poor states than in the poor states. The latter result could reflect the fact that the only children who remain out of school in the non-poor states are children belonging to socially excluded and fringe groups located in hard-to-reach areas and mainstreaming these children into the regular school system is often difficult and expensive.

According to the NSS 55th round data, there were nearly 30 million out-of-school children aged 6-11 in India in 1999-2000. Nearly half of all these children come from the two states of Uttar Pradesh and Bihar. School non-attendance is also very highly concentrated in relatively few villages in the country. A mere 10% of villages in the country account for nearly one-half of all out-of-school children aged 6-11, while 20% of villages account for three-quarters of all out-of-school children. Most likely, these villages are Scheduled Tribe habitations that do not have a primary school of their own and are not within easy walking reach of a primary school. They are also likely to be poor villages where the opportunity cost of child labor (in terms of agricultural work) is high. These results indicate the importance and potential effectiveness of targeting school interventions to those villages and districts having the largest number of out-of-school children.

Getting out - of - school children into school is only one of the education-related millennium development goals. Another goal is retention of students — viz., to ensure that the entire cohort of children who begins grade 1 remains in school until grade 5. This report uses the primary completion rate, as measured by the proportion of 12-year old children who do not report themselves as never having attended school and also report currently being in middle school, as a proxy for retention. The primary completion rate for the country was 61.4% in 1999-2000 — only slightly up from 58.7% in 1993-99 — with large inter-state variations. For instance, Kerala had the highest rate (92.1%), followed by Goa, Maharashtra, Karnataka, and Tamil Nadu. The Northeastern states and Bihar, Madhya Pradesh, Uttar Pradesh, and Rajasthan rank at the bottom, with primary completion rates of 50% or lower. Intra-state variations in the primary completion rate are also very large.

Analysis of unit-record data from the NSS 55th round show significant associations of the age-specific primary enrollment rate, net primary enrollment rate, and primary completion rate with: household living standards (as proxied by per capita consumption expenditure), affiliation to historically-disadvantaged social groups (such as Scheduled Castes and Tribes), adult male and female schooling in the household, electricity coverage, and the level of economic development in a state (as proxied by gross domestic product per capita). Better road access has a significant association with primary completion but not with enrollment. Government expenditure on elementary education per child 6-14 years in a state also has strong positive associations with primary school attendance and primary completion (but not with regular school attendance).

The results also suggest that crime against women, as proxied by the number of cognizable kidnappings of women and girls per capita in a district, is inversely associated with both school attendance and completion for girls.

The results with respect to school infrastructure are interesting. The availability of primary schools per 1,000 children aged 6-11 in a district — an indicator of schooling quantity — is strongly and positively associated with school attendance, but not with primary completion, among 6-11 year olds. On the other hand, an increase in the pupil-teacher ratio at the primary level in a district — an indicator of poor quality of schools — is associated with lower rates of school attendance and primary completion. This suggests that school attendance is currently constrained in India by the availability of primary schools; hence, expanding the number of primary schools (in relation to the population of 6-11 year olds) would be associated with an increase in the school attendance rate. On the other hand, quality improvements, such as a reduction in the pupil teacher ratio, would be associated with an increase in primary completion (as well as in school attendance).

A simulation analysis using the multivariate models estimated above suggests that simultaneous pursuit of several interventions — economic growth, growth of government expenditure on elementary education, electricity coverage, expansion of male and female adult schooling, an increase in the number of primary schools per 1,000 children aged 6-11, and a reduction of the pupil-teacher ratio — would be associated with a 31.5 percentage point increase in the school attendance rate in the poor states by 2015 — enough for them to attain universal primary enrollment. However, the same package of interventions would be associated with an increase of only about 27 percentage points in the net primary enrollment rate by 2015 — well short of the 50 percentage points needed to attain the MD goal. These results suggest that while it may be possible to get all children aged 6-11 in the poor states in school by 2015 with concerted action on many fronts, raising the net primary enrollment or attendance rate to 100% will be significantly more challenging.

A comparable simulation analysis of primary completion in the poor states suggests that, with a combination of the fore-mentioned interventions,[3] the primary completion rate is likely to increase by about 29 percentage points by 2015 — significantly short of the 46 percentage point increase that would be needed to attain the MD goal of 100% primary completion. The simulation results thus highlight the challenges that the Government of India is likely to face as it attempts to accomplish its ambitious goals of universal elementary schooling and completion by 2010.

It is important to note that attainment of the education-related MDGs in India will require, in addition to the interventions discussed earlier, broad-ranging institutional reform in the education sector. Various surveys indicate that the rates of teacher absenteeism in public schools are very high in India, with the situation often being worse in the poor states. Teacher absenteeism is a reflection of the larger problem of lack of accountability of school administrators and teachers to students and their parents. While there are no simple solutions to this problem, evidence from other countries suggests the need for institutional reform that empowers citizens and communities to hold the state accountable for school performance, devolves administrative and financial powers to communities, provides greater autonomy to schools, involves parents in school management, and motivates front-line workers to provide better-quality schooling.

Gender Disparity in School Enrollments

Another of the MD goals is to eliminate gender disparities in schooling, such that the ratio of girls to boys enrolled at all schooling levels, but particularly at the primary and secondary levels, is 100%.

School-based administrative data suggest that India has made impressive gains in reducing the male-female gap in the gross primary enrollment rate in the last fifty years, with the ratio of the female to male gross primary enrollment rate nearly doubling from 41% in 1950-51 to 81% in 1993-94, where it has stayed since. Yet there are large inter state variations in the extent of gender disparity in schooling, with the gender gap being the largest in Bihar, Uttar Pradesh, and Rajasthan, where the gross primary enrollment rate for females is about two-thirds or less than that for males, and the smallest in Punjab, Haryana, Sikkim, and Kerala, where is parity or near-parity in the gross primary enrollment rates for boys and girls. The data also indicate wide variation in the performance of states over time. Between 1980-81 and 1999-2000, for instance, the largest relative gains for girls occurred in Haryana, where the ratio of females to males enrolled in primary school nearly doubled. At the other extreme, Orissa, Uttar Pradesh, and Kerala experienced small relative declines in the female-male ratio (although it is important to note that the female-male ratio of primary school students was already over 95% in Kerala in 1980-81.)

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[3] The package of interventions considered for primary completion is slightly different from that for enrollments. First, increasing the number of primary schools per 1,000 children aged 6-11 is dropped from the projection (as it is not significantly associated with primary completion). Second, increased availability of village roads is included in the projection, as it is significantly associated with primary completion (but not with primary enrollment.

Household survey data from the 55th NSS round of the NSS also show large sub-state differences in the ratio of female to male students in primary and secondary school. In nearly a third of the regions in the country, female students constitute fewer than three-quarters of male students at the primary and secondary levels. Even more disconcerting is the finding that, between 1993-94 and 1999-2000, as many as 30 regions — out of a total of 78 — experienced a decline in the ratio of female to male students. Surprisingly, these regions are located in such states as Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, and even Kerala.

Multivariate analysis of school attendance for boys and girls aged 6-18 years, using the NSS 55th round unit record data, indicates that household consumption expenditure per capita and access to roads are associated with increased gender disparity, as both of these variables have stronger associations with male than with female enrollment. On the other hand, adult female schooling in the household has a much stronger association with female than with male enrollment. Interestingly, the overall volume of public spending on elementary and secondary education per child 6-18 is not significantly associated with gender disparity in enrollment, but the composition of public spending is. An increase in the share of secondary education in government educational spending is associated with reduced gender gap in enrollment, which is consistent with additional public spending on *secondary education* drawing more girls than boys into school, at least in comparison to additional public spending on primary education.

Other variables that are associated with reduced gender disparity in enrollment in the multivariate analysis are the number of elementary and secondary schools per child aged 6-18, better access to electricity, and crime against women (as measured by the number of cognizable kidnappings of women and girls per capita).

Simulations based on the multivariate analysis suggest that a package of interventions implemented gradually over the next decade would be associated with a reduction of 3.6 percentage points (from about 13 percentage points in 1999 to 9.4 percentage points in 2015) in the gender gap in primary and secondary enrollments — less than a third of the distance to the MD goal of a zero gender gap.

One issue that the simulation analysis in unable to highlight is the role of incentives in narrowing gender disparities. Since gender disparities in schooling outcomes are largely caused by parental discrimination against the girl child, public policies that increase the parental incentive to invest in girls, such as tuition waivers for girls and female stipends and scholarships, are likely to work well in narrowing the gender gap. An example of a policy intervention that has worked remarkably well in narrowing gender disparities in secondary school enrollments is the Female Secondary School Stipend program in Bangladesh (see Box V.1). This program seeks to not only increase the enrollment of girls at the secondary level but to also ensure that most of them are retained until graduation from secondary school. Many states in

India also subsidize the schooling of girls in various ways.

Finally, it is important to reiterate the message that a simple expansion of school capacity or introduction of a female scholarship program will not work unless it is accompanied by broad-ranging institutional reform to reduce teacher absenteeism and to make schools and school managers more accountable to students and the community.

Hunger-poverty

The last millennium development goal we consider in this report is the reduction of hunger-poverty. The goal here is to halve the proportion of people who suffer from hunger between 1990 and 2015.[4] For India, this would mean bringing down the headcount ratio of calorie deficiency from 62.2% in 1990 to 31.1% in 2015.

Calorie deficiency is pervasive in India. In 1999-2000, more than one-half (53%) of India's population consumed fewer calories than it required—down from a level of 60% in 1993-94. This is nearly double the estimated national incidence of consumption poverty of 22-26%. There are large inter-state variations in the extent of hunger-poverty, with Assam topping the list with nearly 78% of the population being calorie deficient. The other Northeastern states, Goa and Andhra Pradesh also have very high proportions of calorie-deficient population. At the other extreme, Jammu & Kashmir, Rajasthan, and Uttar Pradesh have the lowest rate of calorie deficiency (30-38%).

The rate at which hunger-poverty declined during the 1990s also varies significantly across states. Uttar Pradesh as well as many of the Northeastern states, such as Mizoram, Manipur, Arunachal Pradesh, and Nagaland, experienced large declines (greater than 10%) in hunger-poverty between 1993-94 and 1999-2000, while four states — Haryana, Assam, West Bengal, and Jammu & Kashmir—experienced an increase in the incidence of hunger. Within-state differences are also large. For instance, the incidence of hunger-poverty varies from 48% to 75% within the state of Gujarat.

Multivariate analysis of calorie deficiency indicates that adult schooling in a household—both that of males and females—is strongly associated with a reduction of hunger-poverty. Rural households and farm households are less likely to be hunger-poor than urban and non-farm households, respectively, reflecting the importance of land in reducing vulnerability. Availability of electricity is not a significant correlate of calorie deficiency, but access to safe drinking water is, particularly in the poor states. Access to roads also has a strong negative effect on hunger-poverty in both poor and non-poor states, but the effect is nearly two times as strong in the poor states.

Production of food in a district and household access to land, particularly irrigated land, are associated inversely with calorie deficiency, with the associations being much stronger in the poor states than in the non-poor states. This suggests that, even after controlling for other factors, access to the means of food production reduces the risk of hunger and calorie deficiency for individuals and households.

Finally, the empirical results indicate a very strong association between economic growth and calorie deficiency, with a one percent increase in mean consumption expenditure per capita in a district being associated with a 0.26%

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[4] Note that there is a separate MDG of halving, between 1990 and 2015, the proportion of people whose income is less than one dollar a day, which we do not consider. The notion of hunger-poverty differs from that of consumption- or income-poverty. Using household survey data on consumption of various foods and on the age, sex and occupations of different household members, we have calculated calorie availability per capita to the household as well as calorie requirements (using normative age-specific calorie requirements adjusted for heavy, moderate and sedentary work). Individuals residing in households whose calorie requirements exceed availability are considered calorie-deficient or hunger-poor. In 1999-2000, the rate of hunger-poverty so defined was 53% in India, as compared to a consumption-poverty rate of 22-26%.

reduction in the incidence of hunger-poverty.

Simulations based on the multivariate analysis discussed above suggest that the proportion of the calorie-deficient population in the poor states is likely to decline by about 14 percentage points (from 47% to 33%) from 1999 to 2015 with a package of six interventions (excluding economic growth) — just slightly short of the MD goal. However, the seventh intervention — viz., general economic growth resulting in a 3% annual rise in mean district consumption expenditure per capita — is associated with a further reduction of 12 percentage points in the calorie deficiency rate. This implies that, together, the seven interventions considered will easily allow the hunger-poverty MDG to be attained by 2015, even in the poor states of the country.

Conclusions

There are several major findings and implications for policy that come out of this report. First, there are very large disparities across different states and regions of India in terms of their performance on the millennium development indicators. Some regions rank low on some MD indicators but not on others. However, there are 18 in the country that rank consistently low on three or more of the five MD indicators considered in this report. Of these, 8 regions rank consistently low on 4 or more indicators, while two regions rank low on all five indicators. These two regions are the South-Western region of Madhya Pradesh and the Southern region of Rajasthan. In a sense, these are the most deprived regions in the country.

The inter- and intra-state disparities have important implications for the targeting of interventions and resources to the lagging states and regions. But they also have another important implication — the need for state-specific approaches that allow for greater flexibility in addressing problems. What works in a state such as Tamil Nadu may not work well in another state, such as Orissa. Even though health and education are state-level subjects in India, the central government plays a strategic role in these sectors via its centrally-sponsored schemes. In the case of health, for instance, centrally-sponsored schemes account for a large portion of the public health and reproductive health activities undertaken in a state. Likewise in the education sector, centrally-sponsored schemes, such as Operation Blackboard, finance a significant portion of non-salary costs of education in the states. It will thus be important to make centrally-sponsored schemes more flexible and more responsive to local conditions.

A second and related finding of this report is that many of the millennium development indicators have high levels of geographical concentration in India. For instance, one-fifth of the villages and districts account for about one-half of all the infant deaths and underweight children in the country. Amazingly, three-quarters of all the out-of-school children aged 6-11 years are concentrated in only 20% of the country's villages. Unfortunately, currently-available data do not allow us to identify these villages, because the sample surveys on the basis of which these observations are made are not large or representative enough at the village level. However, promising new methodologies, based on merging of household survey and population census data, are available for identifying specific villages having the worst human development outcomes. It would be worthwhile to explore the use of such methodologies to identify the villages with the worst MD indicators in the country, so that policy interventions could be better targeted to these villages.

The results on geographical concentration of the MD indicators suggest that targeting resources and interventions to villages and districts with the worst human development indicators is not only desirable for improving equity, but will also be the most effective strategy for attainment of the MDGs. How best to achieve this targeting is an issue that would appear to merit priority attention.

Third, there are other types of disparities in most of the MD indicators, the reduction of which would help in the attainment of the MDGs. Gender disparity is one example. It is estimated that overall child mortality in the country would drop by 20% if girls had the same mortality rate as boys between the ages of 1 month and 5 years. Likewise, the overall school enrollment rate for children aged 6-11 years would increase by about 7% if girls of these ages had the same enrollment rate as boys. Among older children, the equivalent increase in enrollment rates would be even greater (about 10% for 12-14 year olds and 16% among children 15-18 years of age). Just as geographical targeting is likely to narrow regional disparities, targeting by gender can help reduce gender inequalities. Since gender disparities in health and schooling outcomes are largely caused by parental discrimination against the girl child, public policies that increase the parental incentive to invest in girls, such as female scholarships or health-care subsidies for girls, are likely to work well in narrowing the gender gap. (Many states in India already subsidize the schooling of girls in various ways, although gender-targeted subsidies for health-care and nutrition are much less common.) Many empirical studies from around the world, including some evidence presented in this report, suggest that gender disparities in the health, schooling, and nutritional outcomes of children tend to narrow with mother's schooling, as mothers (relative to fathers) tend to invest more in their female children.[5]

Another manifestation of disparity in human development outcomes is along caste and tribal lines. Scheduled Tribes and, in many cases, Scheduled Castes have significantly higher levels of infant mortality and child malnutrition and significantly lower levels of schooling indicators than mainstream groups. For instance, infant mortality among Scheduled Tribes in the poor states is 60% greater than among other population groups after controlling for living standards, adult schooling, and other characteristics. Given that these groups constitute between one-quarter and one-third of the total population of the poor states in the country, improving their MD indicators would help significantly in the attainment of the MDGs in these states. It is likely that many of the villages identified in this report as having the heaviest concentration of infant deaths and underweight and out-of-school children are, in fact, Scheduled Tribe/caste villages. If so, targeted interventions to these villages would achieve the dual objectives of reducing geographical as well as caste disparities. For several decades, India has had an extensive system of quotas and reservations for Scheduled Castes and Tribes in employment and higher education opportunities, but the results in this report suggest that targeting maternal and child health, child nutrition, and primary schooling interventions to Scheduled Castes and Tribes is equally important.[6]

Fourth, there is evidence of significant synergies among the different MDGs. For instance, a reduction in the proportion of underweight children is strongly associated with a reduction of child mortality. Although maternal mortality is an MD indicator that has not been analyzed in this report, it is clear that interventions that reduce maternal mortality, such as tetanus immunization, expansion of antenatal care coverage, and an increase in the ratio of professionally-attended deliveries, will also bring about large reductions in infant (especially neonatal) mortality. Likewise, reducing child malnutrition is likely to result in improvement in both schooling quantity and quality, as better nourished children are more likely to attend school and perform better in school. Thus there are synergies amongst the MDGs that will help in their attainment, which implies that proceeding with simultaneous action on all these measures will have the greatest impact on attainment of the MDGs.

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[5] This is not always the case, however. For instance, it has been observed that excess female child mortality is even more pronounced among better-schooled women relative to women with no schooling, at least in rural Punjab (Das Gupta 1987).

[6] Most state governments in India do offer incentives, such as free textbooks and uniforms, to primary school-aged children belonging to Scheduled Castes and Tribes.

Fifth, despite appreciable improvement in many of the millennium development indicators during the 1990s, the analysis in this report suggests that attainment of the MDGs (at least the five specific goals considered in this report) will remain extremely challenging in the poor states of India. Yet attainment of the MDGs by the poor states — most notably, Bihar, Uttar Pradesh, Madhya Pradesh, Orissa, and Rajasthan — is critical to MDG attainment by the country as a whole, because these states currently account for a disproportionately large proportion of the country's population (and will account for an even larger population share by 2015 owing to more rapid population growth).

Despite the grim situation, the poor states should be able to meet the MDGs relating to infant mortality, child malnutrition, and hunger-poverty with a combination of interventions, including sector-specific interventions (such as nutrition supplementation and immunization), economic growth, improved coverage of infrastructure, and wide-ranging reforms in the institutions of service delivery. However, attaining the education goals will require considerably more effort. This report concludes that while substantial progress could be made by the poor states on increasing the rates of net primary enrollment and primary completion, it will be challenging for them to attain the education-related MDGs of 100% net primary enrollment and 100% primary completion, in large part because of the enormous gap between their current rates of net primary enrollment and completion (only 50% and 54%, respectively) and the MD targets. The simulation analysis also suggests that complete elimination of the gender gap in primary and secondary enrollment, called for by the MDGs, will be a very challenging goal to attain.

Sixth, the simulations carried out in this report indicate that, in the poor states, economic growth that brings about an improvement in household living standards is strongly associated with virtually every MD indicator. For example, real economic growth of 3% per annum in the poor states could alone bring down the child underweight rate from 51% in 1999 to 37% in 2015. This is nearly two-thirds of the total decline in the child underweight rate needed to be attained between 1999 and 2015 to meet the nutrition MDG. Likewise, 3% annual growth could bring about an increase in the net primary enrollment rate from 50% in 1999 to 74% in 2015 in the poor states — about one-half of the total increase in the net primary enrollment rate needed to be attained between 1999 and 2015 to meet the schooling-related MDG. Another example of the important role of economic growth on MDG attainment is provided by the estimates that suggest that a real growth rate of 3% would be associated with a 12 percentage point decline in the incidence of hunger-poverty — nearly three-quarters of the total decline needed to be attained between 1999 and 2015 to attain the MD goal of halving poverty. In other words, rapid economic growth could make a very significant contribution to an improvement in most MD indicators by 2015.

In spite of the strong associations between improvements in MD indicators and economic growth in the poor states, the latter have actually experienced anemic growth over the last two decades. Bihar's real GSDP per capita has grown at less than 1% per annum between 1980 and 1999, while Orissa and Uttar Pradesh have seen annual real growth rates of about 2% or less. In contrast, states such as Maharashtra, Gujarat, and Karnataka have seen their economies expand at real per capita rates of 4% or more over the same time period. What these results underscore is the importance of accelerating economic growth in the poor states to speed progress toward the MDGs. It is beyond the scope of this report to discuss the precise mechanisms by which growth in the poor states could be stimulated, but investment in physical and social infrastructure, combined with improved governance, would probably rank near the top of the list.

Seventh, this report also indicates the importance of infrastructure in attaining the MDGs. For example, simply bringing the poor states to the (average) levels of road, electricity, and sanitation coverage in the non-poor states would be associated with reductions of 6.2 percentage points (or 12%) in the proportion of underweight children and of 13.2 deaths per 1,000 live births (or 18%) in the infant mortality rate. Universal (100%) road, electricity, and sanitation coverage in the poor states would be associated with reductions of 40% in the child underweight rate and of 60% in the infant mortality rate. The estimated associations between schooling outcomes and physical infrastructure are generally smaller, but the results still suggest that universal electrification in the poor states would be associated with increases of 7 percentage point in the school attendance rate (for 6-11 year olds), 5 percentage points in the net primary enrollment rate, and 5 percentage points in the primary completion rate. All of these associations are most likely underestimated, since they do not consider the indirect association between infrastructure and the MD indicators via the positive association between infrastructure and gross state domestic product.

Eighth, consistent with the findings of numerous empirical studies from around the world, this report finds evidence of strong associations between female adult schooling and virtually every MD indicator considered. An additional year of mother's schooling is associated with a reduction of 4% in infant mortality and 3% in child underweight rates and with increases of 1-2% in the net primary enrollment and primary completion rates. In addition, each additional year of adult female schooling is associated with a reduction in the incidence of hunger-poverty by about 1.5% and of gender disparity in school enrollment by as much as 8%.

These results suggest that the large increases in girls' school enrollment that are likely to occur in the coming years (in part due to the Government of India's Sarva Shiksha Abhiyan initiative) will fuel major improvements in all of the MD indicators. Of course, given the lag between a girl's attendance in elementary school and the birth of her children (especially since schooling typically delays both age at marriage and age of first birth), increases in female primary enrollments may not show their full effects on fertility, child and infant mortality, child nutrition, and child schooling for several years (perhaps, a decade or longer). However, increases in female secondary enrollments are likely to show their results much sooner — well before 2015, the MDG reference year.

Ninth, notwithstanding the importance of the general interventions discussed above (e.g., economic growth, infrastructure expansion and female schooling), the analysis in this report suggests that carefully-targeted, sector-specific interventions will also be important in attaining the MDGs. For instance, a package consisting of expanded child and maternal immunization, antenatal care coverage, nutritional supplementation (including promotion of exclusive breast-feeding), and home based neonatal services (including treatment of pneumonia) is likely to bring about significant reductions in both infant mortality and child malnutrition. Likewise, our results suggest that an expansion in the number of primary schools would improve access and likely raise school and primary school attendance rates among 6-11 year olds, while a lowering of the pupil-teacher ratio at the primary level would raise primary completion rates. These results are consistent with evidence from around the world that expanded school access is typically well-targeted to the poor, since poor students are almost always the last to be enrolled in a community.

Tenth, while this report has identified the key interventions that are likely to speed attainment of the MDGs, especially in the poor states, it has not prioritized these interventions. The reason for this is that prioritization of interventions should in part be based on the cost-effectiveness of these interventions, and the calculation of cost-effectiveness entails detailed knowledge of the costs of each intervention. The latter is not trivial, especially when the interventions span several sectors (education, health, nutrition, rural infrastructure, etc.). However, this is clearly the next step in this research. In order to come up with a detailed road map of attaining the MDGs, it will be essential to undertake the costing of each of the interventions considered and proposed in this report.

Eleventh, none of the fore-mentioned interventions are likely to work unless they are simultaneously accompanied by systematic reform of the institutions of service delivery in India. Additional schools are unlikely to increase enrollment or school completion if teachers frequently are absent from school. A package of home-based neonatal services is unlikely to reduce neonatal mortality rates if health workers are not sufficiently motivated to reach out into the community and deliver the package of services to the poor and most-at-risk. The problem of making publicly-provided services work, especially for the poor, has received a great deal of attention in the *World Development Report 2004*. The poor states of India typically have the most serious problems with governance and service delivery in the social (and other) sectors. Better delivery of public services — whether in health, schooling, nutrition, or infrastructure — is a complex and difficult task that entails creation of the right institutions and incentives, including devolving responsibility for service delivery to local governments and communities, contracting out certain types of service delivery to the non-government sector, empowering consumers to demand better services from government health facilities, introducing competition among public providers, and ensuring the motivation of front-line workers.

Finally, the importance of systematically monitoring MD outcomes at disaggregated levels and evaluating the impact of public programs cannot be overemphasized. This report has highlighted the paucity of reliable, *district*-level data on most MD indicators. The lack of such data makes it virtually impossible to monitor progress toward attainment of the MDGs at lower levels of administration. In addition, despite the fact that much has been spent by the government on public programs such as the Integrated Child Development Services and the District Primary Education Program, these programs have not been adequately subjected to rigorous, independent evaluation. In order to choose the right set of interventions with which to attain the MDGs, it is critical to know which programs have been successful in improving MD indicators and which have not.

Introduction

Since the launch of the Millennium Development Goals (MDGs) at the Millennium Summit held in New York in September 2000, the MDGs have become the most widely-accepted yardstick of development efforts by governments, donors and NGOs. The MDGs are a set of numerical and time-bound targets related to key achievements in human development. They include halving income-poverty and hunger; achieving universal primary education and gender equality; reducing infant and child mortality by two-thirds and maternal mortality by three-quarters; reversing the spread of HIV/AIDS; and halving the proportion of people without access to safe water. These targets are to be achieved by 2015, from their level in 1990 (United Nations 2000).

Almost all the countries in the world, including India, have committed themselves to attaining the targets embodied in the Millennium Declaration by 2015. Unfortunately, there is little understanding of whether India will be able to attain all of the MDGs, and whether there are some MDGs that India will be able to attain. There is even less understanding of what it will take — by way of economic growth, public spending on social services, and social-sector reform — to attain the different MDGs. Further, this report argues the importance of disaggregating the MDGs for India, given the very large geographical and Socio-economic variations in millennium development (MD) indicators across the country.

This report focuses on the attainment of five major human development-related MDGs by sub-national units in India — child and infant mortality, child malnutrition, schooling enrollment and completion, gender disparities in schooling, and hunger-poverty (as reflected by inadequate calorie intake). The selection of these MDGs for detailed analysis was based in large part on the availability of reliable sub-national data. For example, reliable data on disease prevalence at the state or sub-state level are simply not available, and this hampers useful sub-national analysis of the communicable disease-related MDG. The same is true of another important MD indicator — maternal mortality.

The basic premise of this report is that there are large disparities in the past performance as well as future prospects of different sub-national units in terms of the MD indicators. India cannot hope to attain the MDGs without significant progress in the MD indicators in its poorest states — Bihar, Uttar Pradesh, and Madhya Pradesh. These states not only currently account for a large proportion of the country's population, but, because of more rapid population growth, will account for an even larger share of the country's population in 2015. The report attempts to identify the specific interventions that will improve substantially the likelihood of the poor states attaining the MDGs.

Virtually all of the analysis in this report is based on two sets of national household surveys. First, unit record data from two rounds of the nationally-representative National Family Health Survey (NFHS), which were collected in 1992-93 and 1998-99, are used to analyze the correlates of infant mortality and child malnutrition (underweight) (IIPS 1995, 2001a). Second, unit record data from the two most recent quinquennial, 'thick' rounds of the National Sample Survey (NSS) — the

50th round conducted in 1993-94 and the 55th round conducted in 1999-2000 — are used to analyze the correlates of schooling enrollment, gender disparity in schooling, and hunger-poverty, at the individual or household level (NSSO 1996a, 2001a). While schooling enrollments could have been analyzed with either the NSS or the NFHS data, we have chosen to use the NSS data, as they are more recent and are drawn from a much larger sample. Since the NSS data do not contain information on infant mortality or child weights, the NFHS data remained as the only alternative to analyze these indicators.[7]

In addition, annual cross-state data over the time period 1980-99 on infant mortality rates, sex-specific gross primary enrollment rates, government expenditure on health, family welfare and elementary education, and gross state domestic product are also used in this report to analyze the correlates of changes in infant mortality and school enrollment over time and across states.

While one of the main objectives of this report is to present a disaggregated analysis of MDGs, availability of data limits the extent to which the analysis can be fully disaggregated. Disaggregation of analysis to the level of the state is possible and is undertaken here. However, going below the state level poses a problem, as data on very few MD indicators are available at the district level. In addition, given the sample design, and size of the NFHS and NSS data, it is not possible to calculate mean values of the MD indicators reliably at the district level from the household surveys. However, many of the surveys are representative at the regional — rather than the district — level. (Regions are a collection of several districts grouped together on the basis of broadly-similar agro-climatic conditions. The National Sample Surveys (NSS) have defined a total of 78 regions for India.) Since regions, unlike districts, are not administrative units, the region-disaggregated analysis that is presented in this report is illustrative of sub-state variations in socio-economic indicators, but is obviously not as useful as district-level analysis for policy-making purposes.

The methodological approach adopted throughout this report is as follows. We apply econometric estimation techniques to unit record data in order to analyze the socio-economic and policy correlates of the selected MD indicators. These estimates are then used to simulate the likely trajectory of the MD indicators under alternative scenarios of change between now and 2015.

By its very nature, any empirical analysis is predicated on assumptions about data quality and measurement, inferences of causality between variables, and potential biases of statistical and econometric estimates. The analysis presented in this report is not immune to these same concerns. It is therefore important to note at the outset that while the results and simulations presented in this report may give an impression of precision, they are not that.[8] They should be treated as indicative of possible broad trends, and could usefully be complemented with other analyses using different methodological approaches. As long as the results are used with this understanding, they can be helpful in 'rough-order' planning for MDG attainment.

Finally, it is important to note an important limitation of the simulations performed in this report. The simulations are based on statistical analysis of household survey data. By its very nature, such analysis tends to over-emphasize readily-measurable variables, such as household income or consumption, adult schooling levels, and access to infrastructure, and under-emphasize qualitative variables, such as the quality of institutions, governance, and empowerment. Obviously, this does not imply that the latter variables are irrelevant to the MD indicators; indeed, institutional reform and good governance are critical to the attainment of the MDGs. While an effort is made in this report to include a discussion of institutions and governance, this is not a central focus of the paper. It is therefore important to view the messages of this report as complementing those from the numerous qualitative (and detailed) studies of health, nutrition, schooling and poverty that have been conducted in the past.

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[7] In addition, there is another nationally-representative household survey — the Human Development Survey — conducted by the National Council of Applied Economic Research in 1993-94 which contains information on all the indicators analyzed in this report. However, since this survey was conducted only once, it does not lend itself to the analysis of changes in various human development indicators over the decade of the 1990s.

[8] In addition to lack of precision, the estimates presented in this report, like other econometric estimates, may be subject to systematic biases arising from measurement errors in the independent variables and from the omission of important variables and unobserved heterogeneity from the analysis.

Infant and Child Mortality

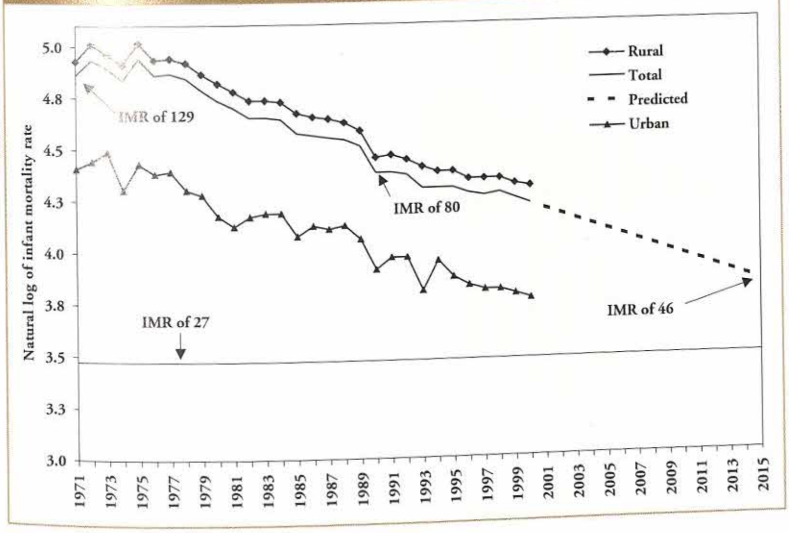
Reduction in infant and child mortality is likely the most important of the millennium development goals, as children are the most important assets of a nation. In India, approximately 1.72 million children die each year before reaching their first birthday, which represents one of the greatest wastes of human potential in the country. The millennium development goal is to reduce infant and child mortality by two-thirds between 1990 and 2015. For India, this would imply a reduction of the infant mortality rate (IMR) to 27 and of the under-five mortality rate (U5MR) to 32 by 2015.

Overall Trends

Infant mortality

Infant mortality has declined impressively in India — from 130-140 infant deaths per 1,000 live births in the early 1970s to 68 in 2000, representing an annual rate of decline of about 2.6 percent (Figure II.1). Further, there is no evidence of a slow-down in the rate of infant mortality decline over this period.[9] If the rate of IMR decline experienced during 1971-2000 is maintained in the future, the IMR for the country as a whole could be expected to fall to a level of 46 in 2015 — still well above the MD goal of 27. However, as argued later in the chapter, this is a simplistic projection that does not recognize the underlying factors that determine infant mortality.

Figure II.1 : Infant mortality rate, by residence, 1971-2000



The data in Figure II.1 also suggest that the rural areas of the country have seen a slightly greater decline in IMR than the urban areas, although the rural-urban gap in IMR remains very wide (with the rural IMR being 72% greater than the urban IMR).

While India has managed to reduce its IMR significantly over the last three decades, its performance on IMR reduction pales in comparison to that of many other countries in South, Southeast and East Asia. Infant mortality has fallen by anywhere from 3-5% annually in the countries shown in Figure II.2, with South Korea being the stellar performer. Even within South Asia, Sri Lanka, and Bangladesh have managed to reduce their IMRs at a faster rate than India (4.3% and 3.3%, respectively). Indeed, what is surprising is that the *level* of infant mortality is now higher in India than in Bangladesh — a country whose per capita GDP is only about one-half of India's.

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[9] A regression of the log of the infant mortality rate from 1971 to 2000 on the time trend and the square of the time trend results in a coefficient on the squared term that is not significantly different from zero. However, the rate of infant mortality decline during the 1990s was slower than during the 1980s, as Cleason et al. (1999, 2000) have argued (although it was not slower than during the 1970s).

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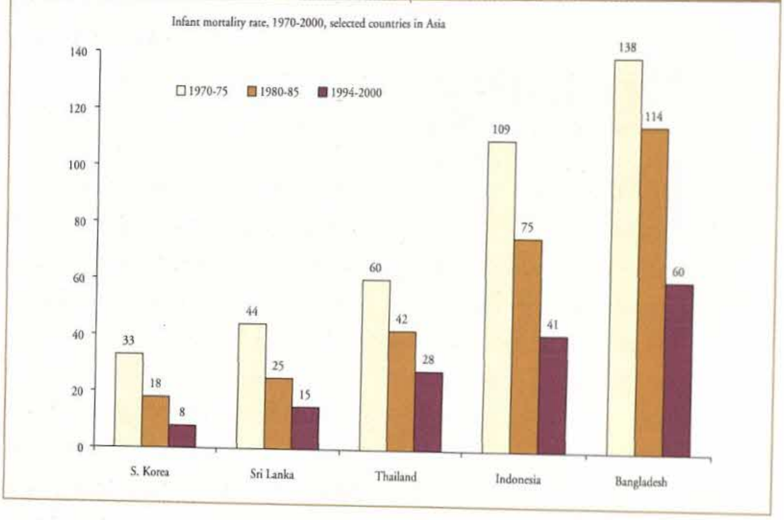
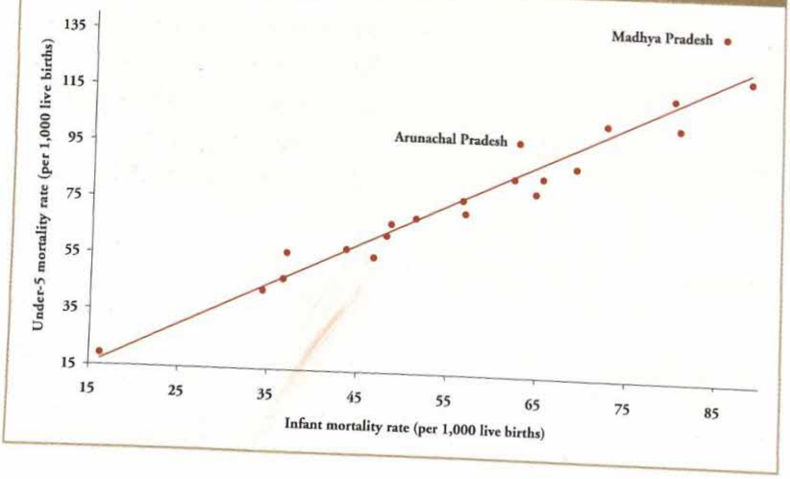
Figure II.2 : Infant mortality rate,1970-2000, selected countries in Asia



Under-Five Child Mortality

Data from the National Family Health Surveys indicate that under-five child mortality (U5MR) rates were 109.3 per 1,000 live births in 1992-93, and declined to 94.9 by 1998-99, an almost identical rate of decline to that in the infant mortality rate. The patterns of inter-state and inter-regional disparities in the U5MR are very similar to those observed for the IMR. This is not surprising as infant deaths constitute more than 70% of all under-five child deaths in the country. Figure II.3, which plots U5MR against IMR for 22 states, finds an almost perfect fit between the two variables. The only states that have a somewhat higher U5MR relative to their IMR are Arunachal Pradesh and Madhya Pradesh. Therefore, the analysis that follows will largely be limited to infant mortality, but most of the conclusions and results from the analysis apply equally well to under-five child mortality.

Figure II.3 : Relationship across states between infant mortality and under-5 mortality rates, 1998-99



Inter-State Variations

It is almost meaningless to talk about an *average* infant mortality rate for India, as there are extremely wide inter-state variations within the country. The IMR in India ranges from a low of 14 for Kerala to a high of 96 for Orissa (Figure II.4). Thus, Kerala is comparable to Bulgaria, Russia, and Ukraine in terms of its IMR, while Orissa is comparable to Lesotho, Cameroon, and Tanzania. This is a wide range of IMRs for a single country.

How have different Indian states performed in terms of reducing their IMRs? The data shown in Figure II.4 are intriguing, since they go against many widely-held perceptions. For instance, the state with the lowest level of infant mortality in 1981 — Kerala — reduced its infant mortality at the fastest rate (5% annually) between 1981 and 2000. But Bihar and U.P., which had among the highest IMRs in the country in 1981, were also among the top performers in IMR reduction over the same period. Andhra Pradesh and Karnataka — states that are normally perceived to be good human development (HD) performers — had the slowest rate of IMR decline over the two decades. In general, there was some — although limited — convergence in IMRs, so that inter-state disparity in infant

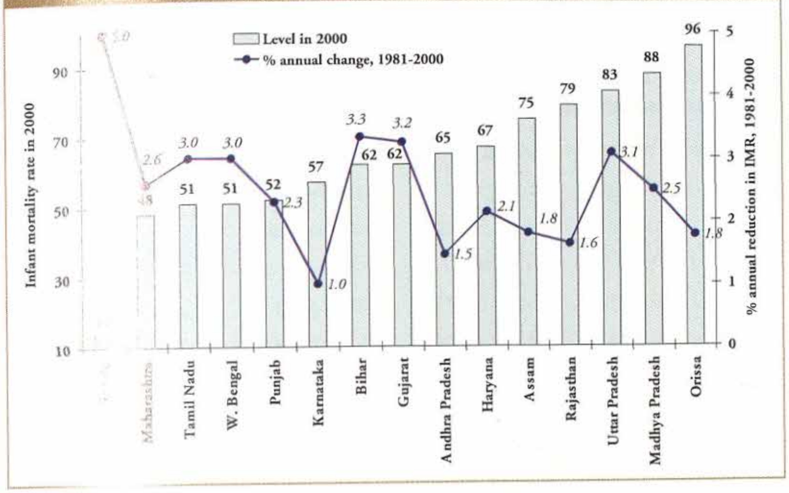


Figure II.4 : Infant mortality rate across Indian states, 1981 and 2000

mortality decreased between 1981 and 2000.[10]

While the discussion on MDGs to date has focused on individual countries reaching the MD goals by 2015, there is no reason why the MDGs should not be applied to individual states or provinces within countries. Indeed, *as long as the distribution of the country's population across states does not change appreciably*, a national MD goal of reducing infant mortality by two-thirds (between 1990 and 2015) could be achieved by each state reducing its IMR by two-thirds. Figure II.5, which shows the implied 2015 MD goals for each of the states, indicates that the range of IMRs that will need to be attained by each state by 2015 for the country as a whole to meet its MD goals is wide — from a low of 6 for Kerala and 41 for Orissa.

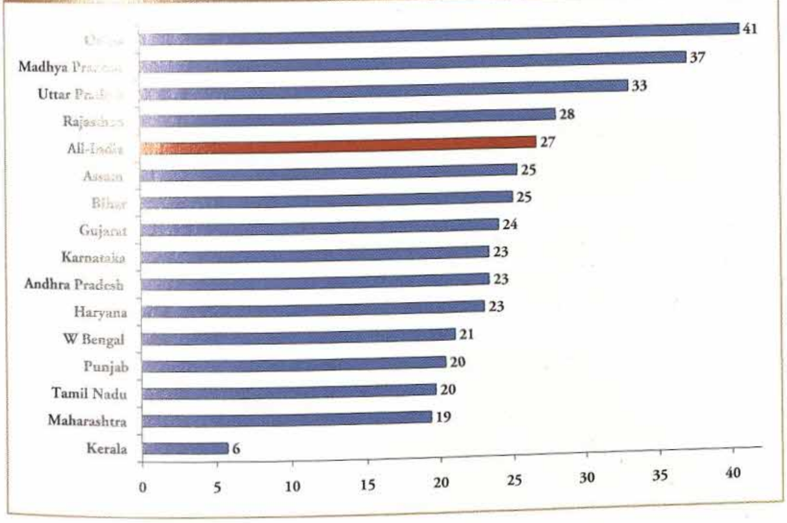


Figure II.5 : State-specific MDGs for infant mortality, 2015

In fact, however, the high-mortality states in the country — Rajasthan, U.P., M.P., Bihar, and Orissa — will account for a larger share of India's population by 2015 owing to their higher fertility and population growth rates. In turn, this will mean that these states will have to reduce their IMRs to *even lower levels* than shown in Figure 5 in order for the country to meet its MD goal of 27. For states like Orissa and Madhya Pradesh to reduce their IMRs by more than 55 infant deaths per 1,000 live births over the next 12 years will be a major challenge.[11]

Intra-State Variations

The state averages of infant mortality mask substantial intra-state variation. Unfortunately, recent estimates of infant mortality are not available at the district level. But estimates are available at the regional level for 1997-99 from the Sample Registration Surveys (SRS).[12] Annex Table 8, which presents region-level estimates of IMR for the country, indicates that the regional IMR ranges from a low of 7.8 per 1,000 live births to a high of 125.3 in 1997-99. The IMR in Northern Kerala is more than two times as high as that in Southern Kerala (19 versus 7.8 per 1,000 live births). In Karnataka, the IMR ranges from 38.8 in the Coastal & Ghats region to 76.5 in the Inland Southern region. The data in Annex Table 8 suggest that the interior of the country generally has higher IMRs than the coastal regions, with a few exceptions.

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[10] For instance, the log variance of the infant mortality rate across states fell from 4.7 in 1971 to 4.1 in 2000.

[11] Both of these states reduced their IMR by 33 infant deaths per 1,000 live births during the 12-year period from 1988 to 2000.

[12] As noted earlier, regions are a collection of several districts grouped together on the basis of broadly-similar agro-climatic conditions. They are not, however, administrative units. The National Sample Surveys (NSS) have defined a total of 78 regions for India. Data from household surveys, such as the NSS, are often representative at the regional — rather than the district — level. As a result, sub-national disaggregation of MD indicators in this paper has been limited to the level of the region.

Annex Table 8 also presents regional data on infant mortality rates in an earlier period — 1988 — 92 (based on the 1991 Census). The table suggests that, while infant mortality fell in most parts of the country, a number of regions experienced no change or even an increase in infant mortality. These regions were distributed throughout the country — in the West, Center, and the South.

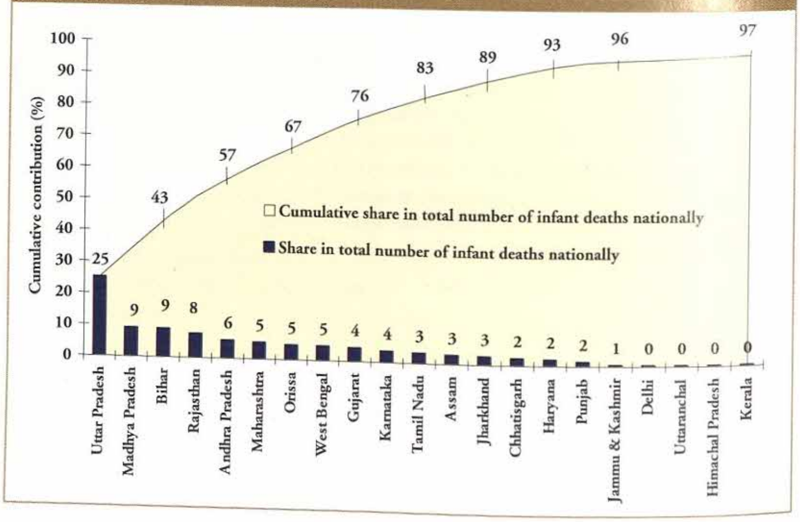
Geographic Concentration of Infant Deaths

It is obvious that targeting IMR-reducing interventions to *populous states with high mortality* will be critical to achieving the MDGs. In addition, from a welfare (and policy) perspective, it may be important to attain the largest reduction possible in the *absolute* number of infant deaths in the country. For this reason, it is useful to look at the contribution of individual states to the number of infant deaths nationally, in addition to the *rate* of infant mortality. The two measures will yield different answers if the states that have the highest IMRs are generally not as heavily populated as the states having lower IMRs. In the case of India, however, many of the states having the highest IMRs are also among the most populous states in the country (e.g., Uttar Pradesh and Madhya Pradesh). As a result, the two measures — the infant mortality *rate* and the *absolute* number of infant deaths — paint a similar picture of where the problem of infant mortality mainly lies.

Figure II.6, which plots the individual as well as the cumulative contribution of the 21 larger states to the total number of infant deaths in the country in 2000, shows that Uttar Pradesh alone contributes one-quarter of all infant deaths in the country.[13] Four states — Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan — together account for slightly more than one-half of all infant deaths in India. The geographical concentration of infant deaths points to the importance as well as the potential efficacy of state-level targeting of IMR-reducing interventions.

In principle, targeting interventions to a smaller geographical unit, such as a district or village, could be even more effective. The NFHS-2 data are suggestive of infant deaths in India being heavily concentrated in a relatively small number of districts and villages. For instance, in the period 1994-99, a mere 20% of the villages and 22.5% of the districts in the NFHS-2 sample with the largest

Figure II.6 : Contribution of the 21 larger states to national infant deaths, 2000



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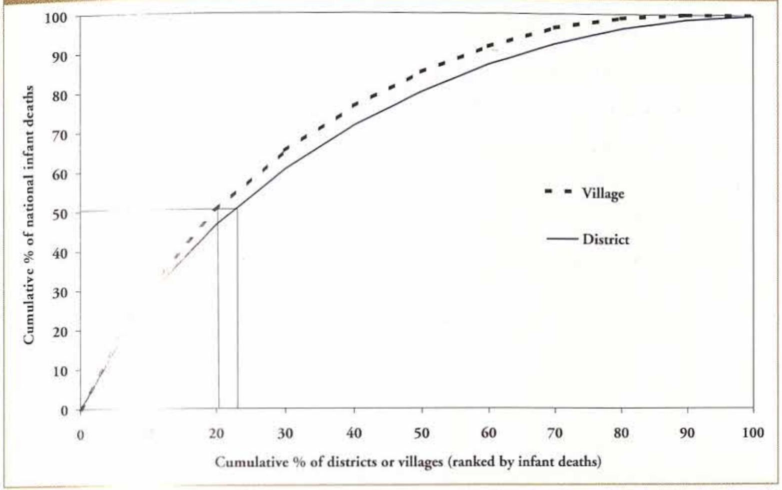
[13] The state accounts for slightly less than 17 percent of India's population.

Figure II.7 : Comulative distribution of infant deaths in India across districts and villages, 1994-98



number of infant deaths accounted for half of all infant deaths in the country during that year (Figure II.7). Since the NFHS-2 covered only a fraction of all the villages in the country and the number of sampled households in each village is too small to be representative, these numbers are merely suggestive of possible patterns. There are promising new methodologies available for more accurate identification of village HD and poverty outcomes on the basis of merged household survey and population census data. It would be worthwhile to explore the use of such methodologies to identify the districts and villages with the largest number of infant deaths in the country, so that government initiatives could be better targeted to these districts and villages.

Concentration of infant deaths occurs even below the level of a district or village. Using data from the NFHS-2 for three states (Uttar Pradesh, West Bengal, and Kerala), Arulampalam and Bhalotra (2002) find that the probability of a child dying during its first year of life is 0.03 if the sibling born immediately prior to it survived past age one but rises to 0.14 if the previous sibling died in infancy. This results in a clustering or concentration of infant deaths within particular households. In practice, however, targeting policy interventions to households is considerably more difficult than targeting of interventions to entire villages or districts.

Economic Growth, Public Spending on Health, and Infant Mortality Reduction

It is clear that there has been a wide divergence in the performance of different states in reducing infant mortality. An important issue is the extent to which this divergence is associated with economic growth and public spending on health. We have merged state-level data on IMRs over the period 1980-2000 with state-level data on real gross state domestic product per capita (GSDP) and real public spending on health over the same period to explore the association between infant mortality on the one hand and public spending and economic growth on the other.[14, 15]

A plot of the data suggests an inverse association between infant mortality and real government expenditure on health and family welfare (Figure II.8). In addition, there is a hint of the association being stronger at lower levels of public spending on health and weaker at higher levels, although with

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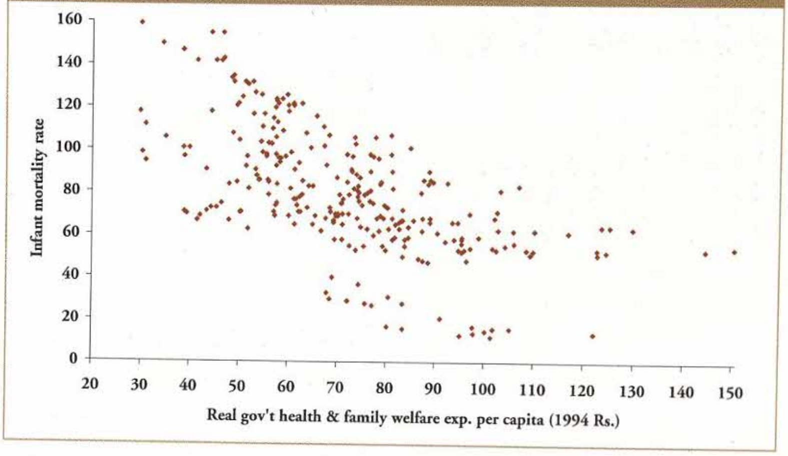
[14] Data on *actual* (not simply *budgeted*) government health expenditure were obtained from detailed budget demand documents of individual states. Expenditure on health includes spending on public health; urban and rural health services; medical education, training and research; general administration; and family welfare (i.e., population programs, including maternal and child health). It includes expenditure incurred by a state out of its own revenues as well as central government health allocations to that state.

[15] The association between infant mortality and *private* spending on health is of less interest because private spending is not a direct instrument of policy. In addition, as private expenditure is subject to household choice, it is highly endogenous to health outcomes.

Figure II.8 : Infant mortality rates and real public spending on health and family planning per capita, across 13 major states, 1980-99



no controls for a time trend or for other variables that may also be associated with infant mortality (such as per capita income), it is difficult to make a definitive statement about the association.

In Annex II.1 an attempt is made to estimate the relationship between infant mortality, government health expenditure, and GSDP more formally and with controls for other variables. While the results of the analysis are not unambiguously clear, there is some evidence, although not persistent, of a significant inverse association between infant mortality and government health expenditure across states. In addition, some, but not all, specifications seem to indicate a stronger inverse association for the very poor states than for the non-poor states.

The econometric results presented in Annex II.1 indicate significant associations between infant mortality on the one hand and female literacy and per capita GSDP on the other. Interestingly, per capita income and female literacy have a significant *interactive* association with infant mortality such that the inverse association between infant mortality and female literacy is stronger at higher income levels than at lower income levels.[16]

The stronger inverse association between infant mortality and public spending on health for the very poor states, observed in some of the econometric specifications, may be related to the composition of infant deaths across poor and non-poor states. Typically, states with high infant mortality rates have a larger proportion of infant deaths occurring during the post-neonatal period. These deaths are more easily averted by the typical (and relatively inexpensive) child survival interventions. As such, it is much easier to bring down infant mortality rates in the poor, high-mortality states with proven, low-cost, post-neonatal interventions, such as child immunizations and oral rehydration therapy. On the other hand, averting neo-natal deaths, which are relatively more common in the better-off, low-mortality states, typically requires more expensive interventions, such as professionally-attended deliveries or deliveries in institutions as well as post-delivery and hospital-based emergency care.[17] This highlights the need for state-stratified mortality reduction policies.

Innate Mortality Differences across States

An appealing feature of the fixed-effects regression for infant mortality that has been estimated and discussed in Annex II.1 is that it controls for observed and unobserved (but

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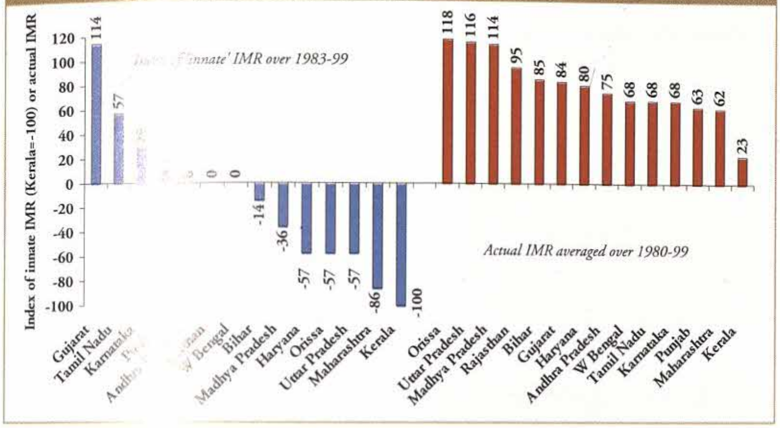
[16] Likewise, the inverse association between infant mortality and per capita income is stronger at higher levels of adult female literacy. The results indicate that female literacy and the level of development in a state complement (rather than substitute for) each other in terms of their association with infant mortality.

[17] Although neo-natal mortality reduction typically requires hospital-based care, it is possible to provide a relatively inexpensive package of home-based neonatal services, as shown by a highly-successful field trial in Maharashtra in 1995-98 (see Box II.1 for a detailed description of the intervention).

Figure II.9 : States ranked by "innate" infant mortality (i.e., infant mortality after control for per capita GSDP, public spending on health, and adult female literacy, averaged over 1983, 1987, 1993 and 1999) and by observed IMR averaged over 1980-99



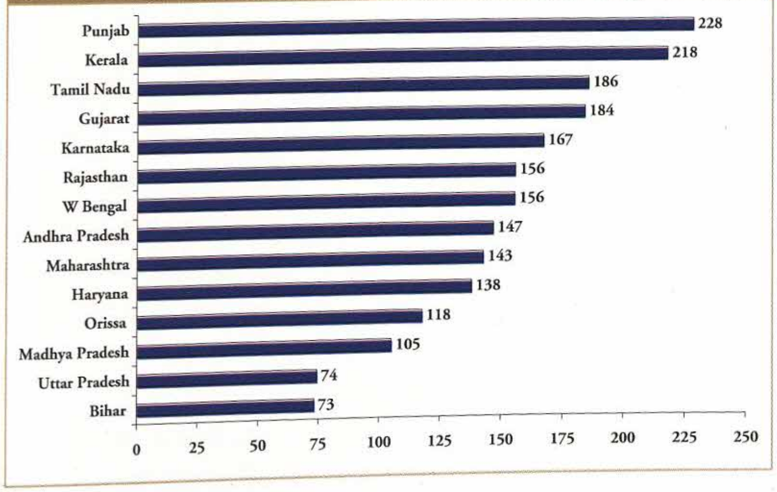
time-invariant heterogeneity in health conditions across states.[18] The heterogeneity could arise from inter-state differences in culture, history, governance (including poor public expenditure management, and initial health conditions (typically caused by time-invariant factors, such as geographical location or isolation). An examination of these IMR 'fixed effects' indicates, predictably, that Kerala has the lowest levels of infant mortality even after controlling for public spending on health, per capita income, and adult female literacy (Figure II.9). Surprisingly, however, the poor, high-mortality states, such as Bihar, Uttar Pradesh, Madhya Pradesh, and Orissa, do not rank poorly on this indicator, indicating that these states enjoy relatively low infant mortality relative to their per capita income, public spending on health, and female literacy levels. At the other extreme, Gujarat, Tamil Nadu, and Karnataka have the largest positive residuals, indicating that these states have relatively high infant mortality rates relative to their per capita income, public spending on health, and female literacy.

An encouraging interpretation of these results is that the poor states are not intrinsically predisposed to high levels of infant mortality. Infant mortality can be brought down significantly in these states with a combination of interventions that include economic growth, improvements in female literacy, and increased public spending on health.

Government Health Expenditure

Figure II.10, which reports the amount of government health expenditure per capita in the different states, indicates wide variations in public spending across states, with the levels of spending in Bihar and Uttar Pradesh being only half as much as in Maharashtra and Andhra Pradesh and a mere third of the level found in states such as Kerala and Punjab.

Figure II.10 : Per capita government revenue expenditure (state plus central) on health and family welfare (nominal prices), by state, 1999-2000



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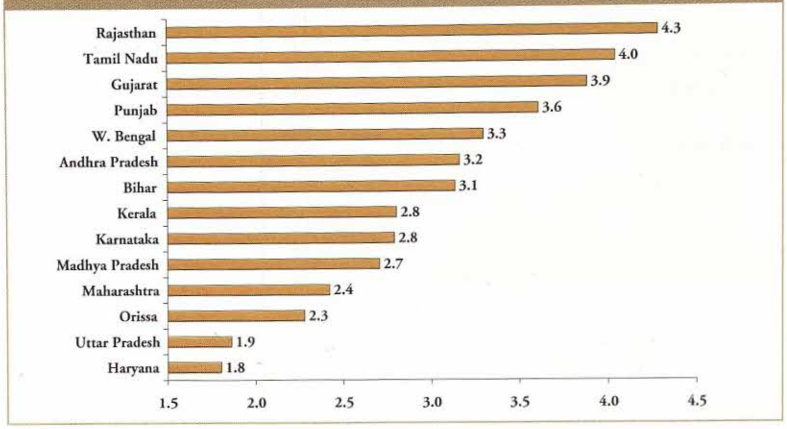
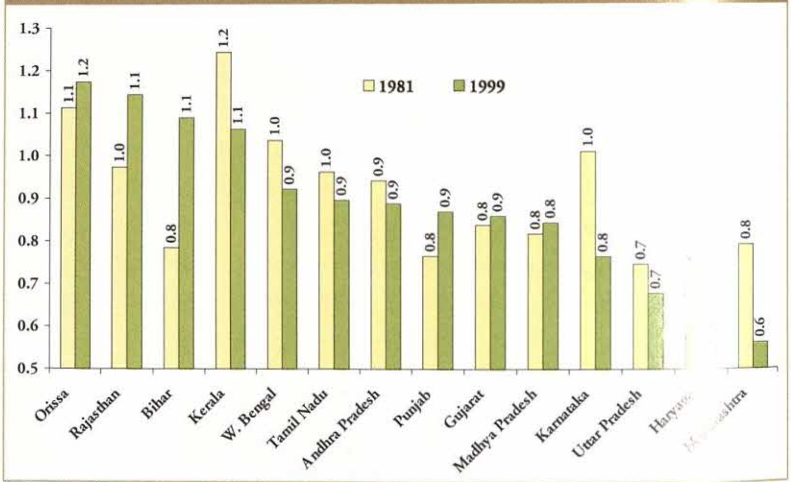
[18] The fixed effects are recovered by averaging the residuals of the estimated infant mortality regression over the sample period for each state.

Figure II.11 : Average annual increase (%) in real government health expenditure per capita, by state, 1981-99



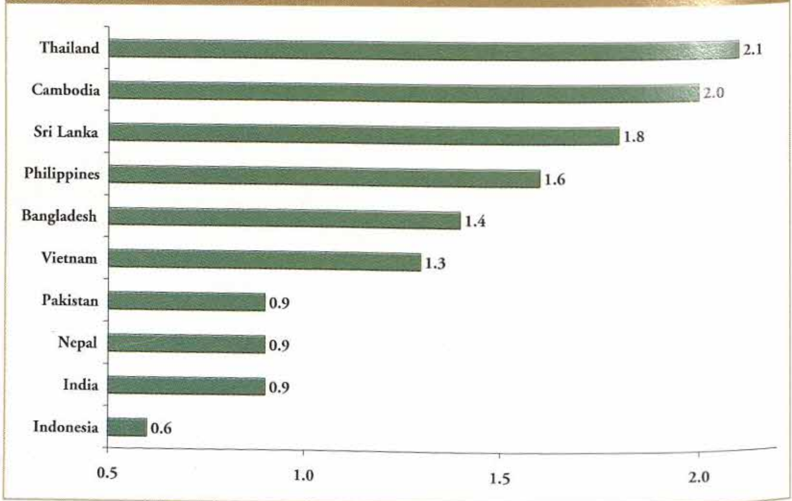
However, the performance of the poor states, such as Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, and Orissa, has been mixed when one considers the *increase* over time in real public spending per capita on health (Figure II.11). While Uttar Pradesh and Orissa had the slowest real increase in public spending on health over the period 1981-99, Rajasthan experienced the largest increase of any state, and Bihar ranked in the middle of the states considered in Figure II.11.

Figure II.12 : Public spending on health as % of gross state domestic product, 1981-82 and 1999-2000



Rajasthan and Bihar also saw a sharp increase between 1981-82 and 1999-2000 in the ratio of public spending on health to GDP, although, in the case of Bihar, this largely reflected the very slow increase in real GDP over these years (Figure II.12). On the other hand, the ratio of government health expenditure to GDP declined in Uttar Pradesh and stayed stagnant in Orissa.

Figure II.13 : Public expenditure on health as % of GDP, selected countries in Asia, 2000 (Source: UNDP 2003)



How does India's spending on health compare to that of other developing countries, especially in the region? Figure II.13 suggests that India generally under-spends on health relative to other countries in Asia (with the exception of Pakistan, Nepal, and Indonesia). Even within South Asia, Bangladesh, and Sri Lanka spend significantly more resources on health (as a percentage of their GDP) than does India.

In addition to the total amount of public spending on health, it is important to also consider the functional composition of health spending. It is widely recognized that health outcomes, especially infant mortality outcomes, are more responsive to preventive health interventions, including communicable disease control and child immunization, than to the provision of curative services, typically in hospitals. In addition, evidence from several countries, including India, indicates that public spending on immunizations and preventive care is much more pro-poor than that on hospital-based curative services. For instance, Mahal et al. (2002a,b) find that the bottom two consumption quintiles receive 47% of the public subsidy for immunization in India but less than 20% of the public subsidy for hospitals.

Figure II.14 : Functional composition of state government health expenditures, 1981

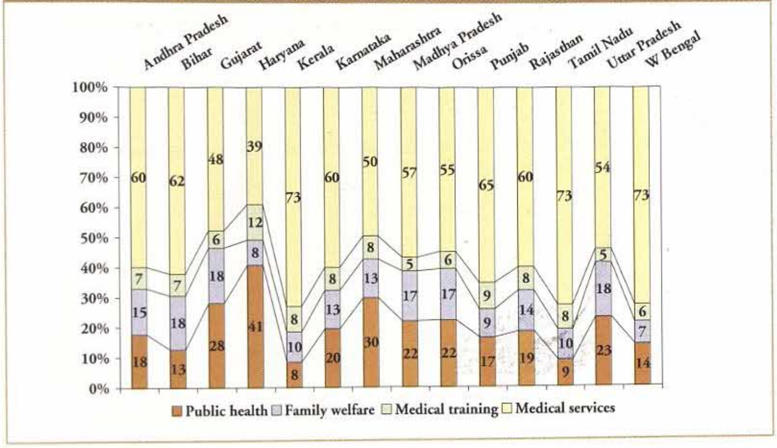
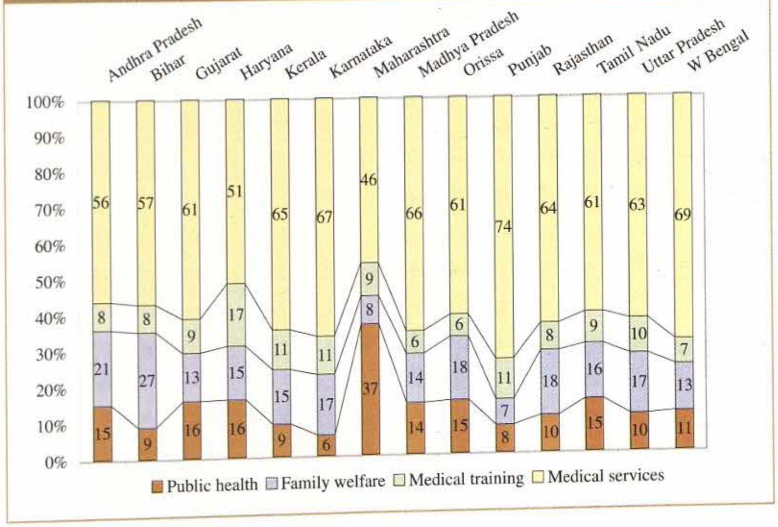


Figure II.15 : Functional composition of state government health expenditures, 1999



Unfortunately, the lion's share of government health expenditure in most Indian states goes toward the provision of health services, typically in hospitals. Relatively little is spent on preventive health activities. The functional distribution of state government health expenditure in 1981 and 1999 is shown in Figures II.14 and II.15. What is disconcerting to note is that in virtually all the states, with the exception of Maharashtra, Tamil Nadu, and Kerala, the share of government health expenditure devoted to public health declined between 1981 and 1999. Correspondingly, the share spent on medical services increased.

Getting the states to increase their relative allocation to preventive health activities is not straight-forward, however. One of the characteristics of public spending on health in India is that the central government accounts for a large share of the total government expenditure on public health and family welfare activities in a state — typically via centrally sponsored (vertical) schemes. The states tend to finance medical services, typically curative, out of their own revenue.[19] In 1999-2000, for

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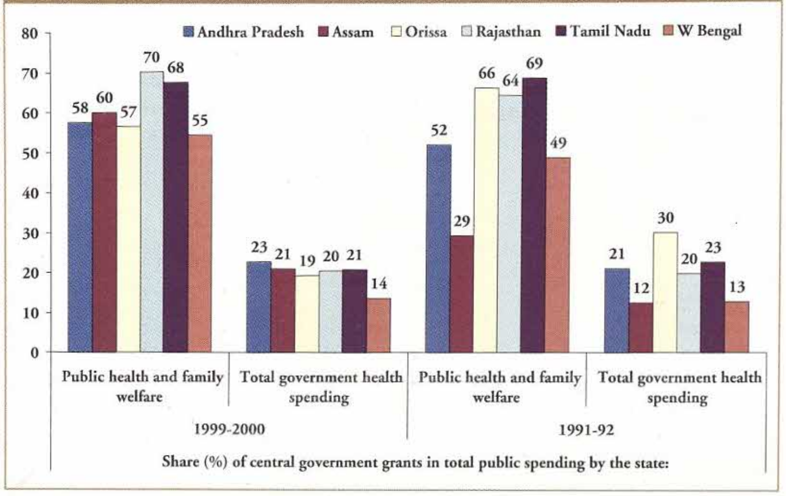
[19] Of course, strictly speaking, not all of the state government spending on medical services is curative, since some of it goes into the financing of primary and community health centers, which are responsible for many public health functions. Sub-health centers are, however, largely financed by the central government.

Figure II.16 : Share of central grants in total government (revenue) expenditure on health, by function, selected states, 1991-92 and 1999



example, central government grants accounted for one-half to nearly three-quarters of government expenditure on public health and family welfare activities in six states for which reliable data are available (Figure II.16). Further, there is evidence that central government financing of public health and family welfare activities in the states has increased somewhat over the years.

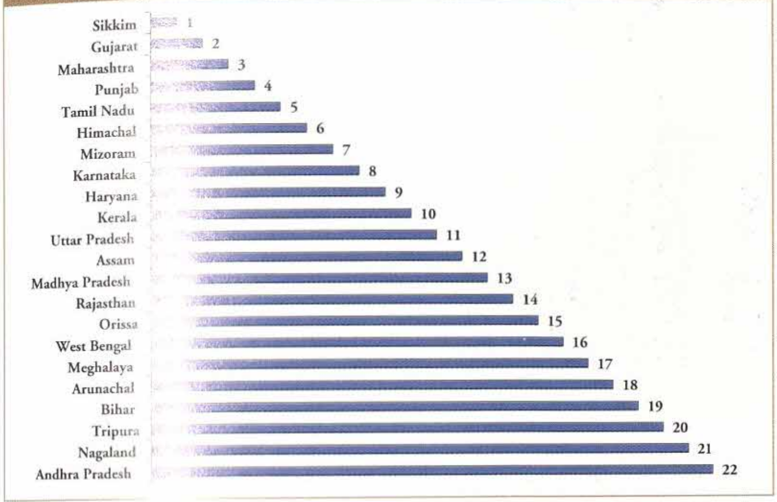
There are two ways to increase the share of public health and family welfare in total government health spending in the states. First, the central government could simply increase the volume of resources it allocates to the states for public health and family welfare activities. This is unlikely to be a sustainable alternative for a number of reasons, including the possibility that the states could then respond by allocating even fewer of their own resources to preventive care and MCH (and more to medical and curative services). Second, the central government could make its grants to the states as matching grants, so that the states that spend more of their own resources on public health and family welfare activities could qualify for larger central grants. This type of matching formula might create the necessary incentives for states to direct increasingly larger shares of their overall health spending to communicable disease control and preventive health activities.

Quality of Public Spending

The finding that the decline in infant mortality relative to the increase in real per-capita public spending on health over 1981-99 was largest in the poor, high-mortality states, such as Uttar Pradesh, Bihar, Madhya Pradesh, and Orissa (Figure II.9), should be tempered by two observations. First, these states do considerably worse than the non-poor states, especially in the South, in terms of targeting government health subsidies to the poor. Based on NSS data from 1995-96, Mahal et al. (2002a) find that all the southern states, but particularly Kerala and Tamil Nadu, show a 'progressive' distribution of subsidies (in that the ratio of subsidies to per capita household consumption expenditure falls with per capita household expenditure), whereas the poor states (such as Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, and Orissa) have a 'regressive' distribution of public subsidies on health.

Second, governance and service delivery problems in the poor states are often worse than in other states. In the poor states, there is widespread absenteeism of doctors and paramedics at government health centers and sub-centers; most government health facilities are in disrepair; and the availability of drugs and medical supplies at public health facilities is typically nonexistent. For example, a recent survey across India indicates that 58% of health workers in primary health facilities in Bihar were absent from their positions on any given day (Chaudhury et al. 2003). In the country as a whole, 43% of primary health care workers are absent from their place of work. Another national survey conducted by the Public Affairs Centre, which ranked the performance of government health services on a number of indicators, such as access, usage, reliability and user satisfaction,

Figure II.17 : Ranking of states in the performance of government health services, 2002



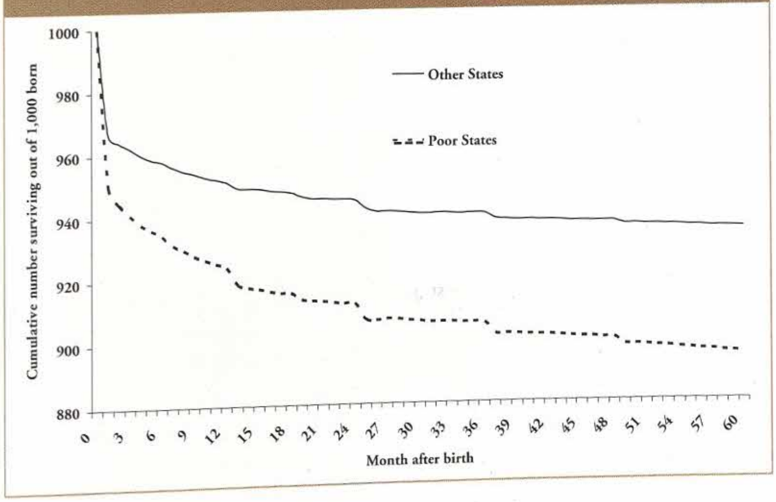
found that the poor states typically rank in the bottom half of all the states in the country in terms of the quality of their public health services (Figure II.17) (PAC 2002). The poor quality of health services reflects many factors at work, including lack of accountability for public health providers and disenchantment with working conditions among health workers.

Proximate Causes of Infant Mortality

To understand what other policy interventions might be needed to help India attain its infant mortality MDG, one needs an understanding of the proximate — or intermediate — causes of infant mortality in India. An answer to this question can be found in the data on timing of deaths, obtained from analysis of unit record data from the National Family Health Survey 1998-99 (NFHS-2);[20] these data suggest that nearly two-thirds of infant deaths (0-11 months) — and about one-half of under-5 child deaths — occur within the first month after birth (Figure II.18).[21]

Thus, an important cause of infant and child mortality can be found in the first month of a child's life (the neonatal period). Unfortunately, data on the specific medical causes of neonatal deaths are not readily available (in large part because the majority of infant deaths are not medically attended), but it is likely that factors such as maternal malnutrition and post-delivery complications, such as umbilical cord sepsis, are generally responsible for many neonatal deaths. (A three-year field trial to provide home-based neonatal care by village health workers in the state of Maharashtra in 1995-98 resulted in a 46% reduction in infant mortality and a 62% reduction in neonatal mortality in the treatment area. See Box II.1 at the end of this chapter.)

Figure II.18 : Cumulative number of children surviving out of 1,000 born, by age (in months), in poor and other states, 1994-98



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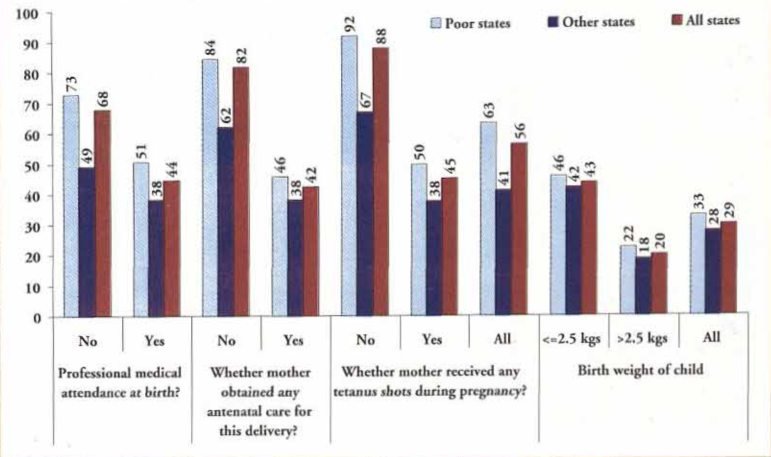
[20] Infant mortality rates can be calculated from the NFHS-2 for the four-year period preceding the survey (i.e., 1994-98). See Annex B for a description of the data.

[21] These figures are broadly similar to those published by the civil registration system (see *Medical Causes of Death*, 1999).

Figure II.19 : Proximate causes of infant mortality in poor and non-poor states, 1996-98



The NFHS-2 data provide some information on the proximate correlates of infant mortality. These are shown in Figure II.19 for two groups of states: poor states (i.e., those that have a monthly per capita consumption expenditure of Rs. 676 or less according to the National Sample Survey 1999-2000 round) and non-poor states (those having a per capita consumption expenditure of more than Rs. 676).[22] Figure II.19 indicates that when a woman receives tetanus shots during her pregnancy, the subsequent survival prospects for the child from that pregnancy are significantly raised. In the poor states, the infant mortality rate is nearly two times as high when the mother has not received tetanus immunization than when she has (92 versus 50).[23]

Likewise, children with low birth weights are more than two times as likely to die during infancy as children who weighed more than 2.5 kilograms at birth.[24] Medical attendance (i.e., doctor, nurse or skilled birth attendant present) at birth is associated with a large reduction in infant mortality, especially in the poor states. Interestingly, however, receipt of any antenatal care by a woman is even more strongly associated with infant survival than professional attendance at birth. In the poor states, the infant mortality rate for children whose mothers did not obtain any antenatal care is 83% greater than that for children whose mothers obtained some care. Thus, antenatal care and tetanus immunization of a pregnant woman appear to be more strongly associated with infant survival prospects than professional attendance at birth.

A child's birth weight is, in large part, influenced by the mother's nutritional status at delivery. This is observed in Figure II.20, which shows that while 32% of children aged 0-35 months whose mother's weight was less than 35 kgs were likely to be of low birth weight, only 15% had low birth weight when the mother's weight was 50 kgs or more. Since infant mortality is related to low birth weights, this implies that infant mortality is also determined in part by maternal weight. Again, Figure II.20 indicates this to be the case, but only in the poor states of the

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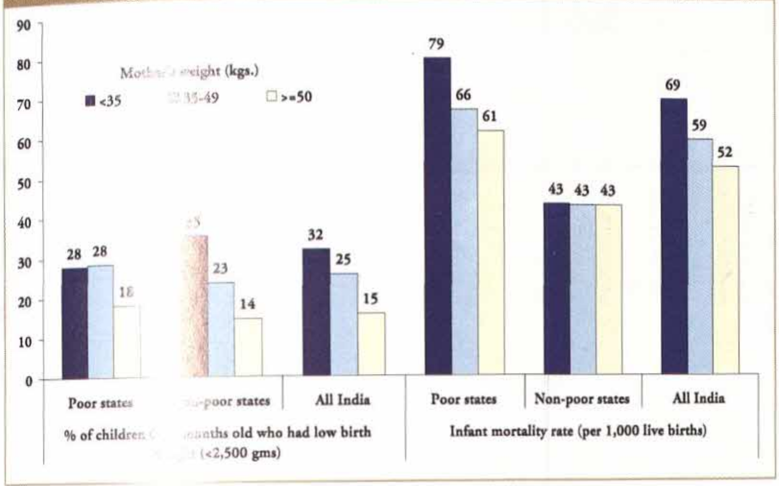
[22] Defined in this manner, the poor states are Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Manipur, Orissa, Rajasthan, Sikkim, West Bengal, Uttar Pradesh, and Tripura. The other (non-poor) states are: Goa, Gujarat, Haryana, Himachal Pradesh, Jammu, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Tamil Nadu, New Delhi, and Arunachal Pradesh.

[23] The data on antenatal care and institutional deliveries were collected in the NFHS-2 only for the last two pregnancies of every eligible woman during the 35 months preceding the survey. As a result, the sample of children for whom data on antenatal care, place of delivery, and anthropometry are available is not a random sample of the entire child population or of all the live births in the country. Hence, the infant mortality rate obtained from this (truncated) sample is not comparable to the IMR reported in the succeeding section of this chapter (which is based on all live births during the four years preceding the survey).

[24] Note that data on birth weights were not available for all children in the NFHS-2 survey. Indeed, the data suggest a strong selection bias in the women who reported their child's birth weight; the infant mortality rate for this group of children is significantly lower than the IMR for children with missing birth weights.

Figure II.20 : Low birth weight children, infant mortality, and maternal weight, 1998-99

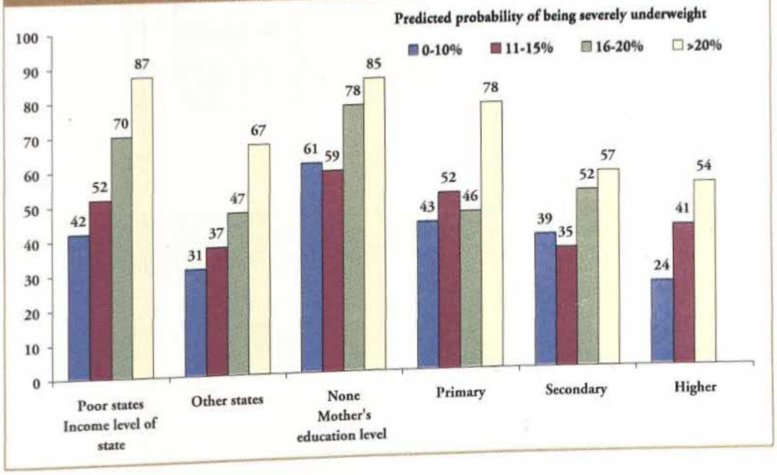


country. In these states, infant mortality is nearly 30% higher when the mother weighs less than 35 kgs than when she weighs 50 kgs or more.

After the first month of life, child malnutrition becomes an important contributing factor to infant and child mortality in India. Malnutrition sets in early, often owing to improper feeding practices, such as early termination of exclusive breast-feeding and introduction of (inadequate) supplementary feeding. In addition, even during the exclusive breastfeeding period, infants may be malnourished owing to insufficient quantities of breast milk — in turn the result of poor nutrition and heavy workload of poor women. Malnourished infants are more prone to diarrheal, respiratory and other infections, which, when untreated, can lead to infant death.

It is often difficult to establish the correlation between child malnutrition and mortality in the absence of longitudinal data, since anthropometric data from most cross-sectional surveys are available only for children living at the time of the survey. We have used the NFHS-2 data to predict the probability of a child being severely underweight,[25] based on a maximum-likelihood probit regression of underweight status on various child and household factors (e.g., age, sex, birth order, maternal schooling, schooling of the household head, etc.). Although the probit regression is estimated only on a sample of living children (obviously), the risk of malnutrition can be predicted for all children — living and dead — based on their characteristics at birth (such as sex and birth order) as well as on the characteristics of their households. Infant mortality rates for children at different predicted risks of severe weight malnutrition are shown in Figure II.21. The results are striking; they suggest that, in both poor and non-poor states, the risk of infant death increases dramatically with the probability of being severely underweight. An infant with a

Figure II.21 : Infant mortality rates, by predicted probability of a child being severely underweight



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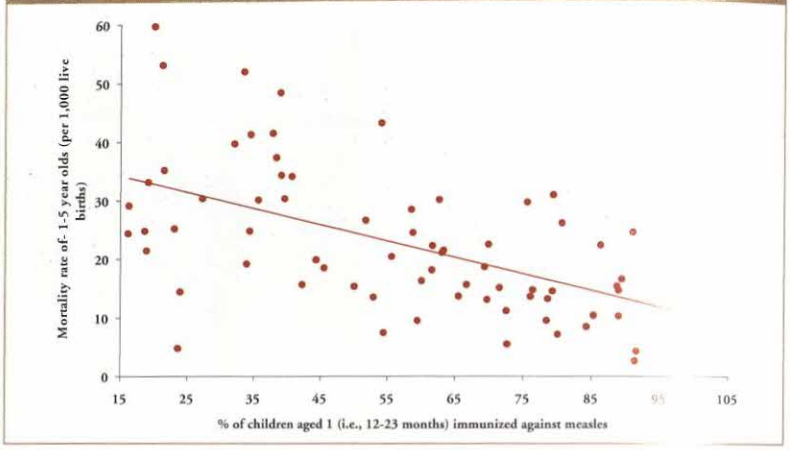
[25] As in the literature, a child is considered severely underweight when his or her weight-for-age is more than three standard deviations below the NCHS reference weight.

20% risk of being severely underweight has an infant mortality rate that is more than two times that of an infant with a less-than-10% risk of being severely underweight. This difference in infant mortality is observed even for women with primary, secondary and higher schooling, suggesting that maternal schooling cannot easily reverse the low survival prospects of a malnourished infant.

Data from the NFHS-2 on under-five mortality rates and child underweight rates for 69 regions also show a positive, albeit not perfect, association between the two rates (Figure II.22). Of course, some regions, such as the Central Region of Uttar Pradesh, Meghalaya, and Sikkim, have unusually high under-5 mortality rates relative to their child underweight rates, while other regions, such as Northern Kerala and Coastal Maharashtra, have unusually low under-5 mortality.

Figure II.23 : Relationship across regions between one-year olds immunized against measles and the mortality rate of 1-5 year olds, 1998-99



In addition to nutrition, immunization plays an important role in enhancing a child's survival prospects, especially beyond infancy. Indeed, child immunization is an important enough input into child mortality to be considered as a separate MDG (with the goal being universal immunization of one-year olds against measles). The evidence from NFHS-2 relating to the role of child immunization on mortality is shown in Figure II.23 and Annex Table 8. Two observations can be made from these figures; first, there are very large regional variations in the child immunization rate. (See Annex Table 8 for regional data on measles vaccination coverage.) The percentage of one-year olds immunized against tetanus ranges from 16% (in Northern Bihar) to 100% (in Eastern Maharashtra). Second, higher measles vaccination rates are associated with lower child mortality between ages 1 and 5 years (Figure II.23).

Figure II.22 : Relationship across regions between under-five child mortality rate and child underweight rate, 1998-99

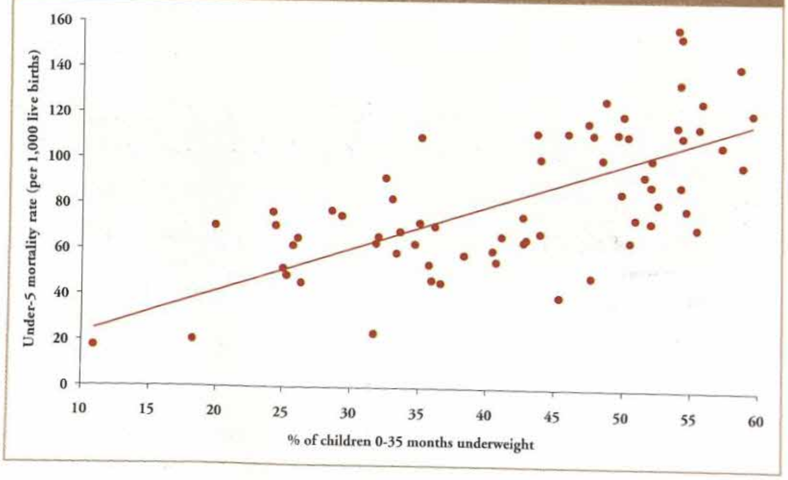
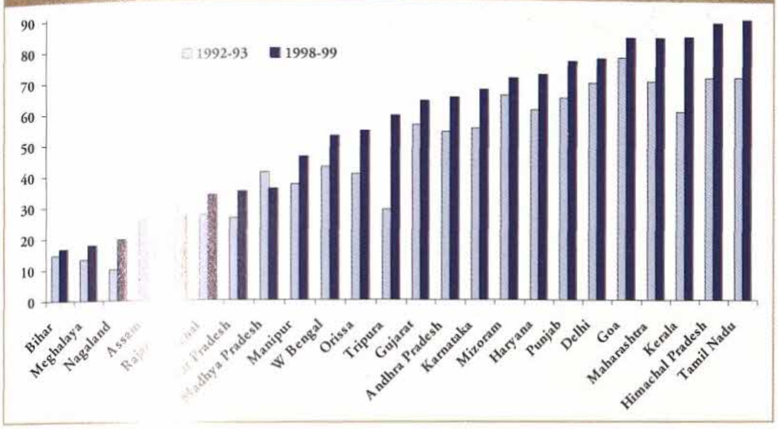


Figure II.24 shows the measles vaccination rate among 12-23 month olds by states in 1992-93 and 1998-99. Most states experienced relatively slow progress in expanding measles immunization over that 6-year period, with the overall rate of measles vaccination in the country increasing from 42% to 51%. In three states — Madhya Pradesh, Rajasthan, and Assam — the measles vaccination rate actually fell over the six years. In

Figure II.24 : Measles vaccination rate (%) among 12-23 month olds, by state, 1992-93 and 1998-99



Bihar, which had only 15% of children immunized against measles in 1992-93, the immunization rate increased by merely 2 percentage points between 1992-93 and 1998-99. Thus, there appears to be significant potential for reducing infant — especially, post-neonatal — mortality in the poor states of the country [illegible] an expansion of child immunization.

Socio-economic and Policy Correlates of Infant Mortality

In this section, we present descriptive statistics on infant mortality based on the NFHS-2, tabulated by various socio-economic characteristics of households, access to infrastructure, and availability of government programs. It should be noted that the associations shown and discussed below are simple correlations, not necessarily causal relations.

Gender disparity and birth order

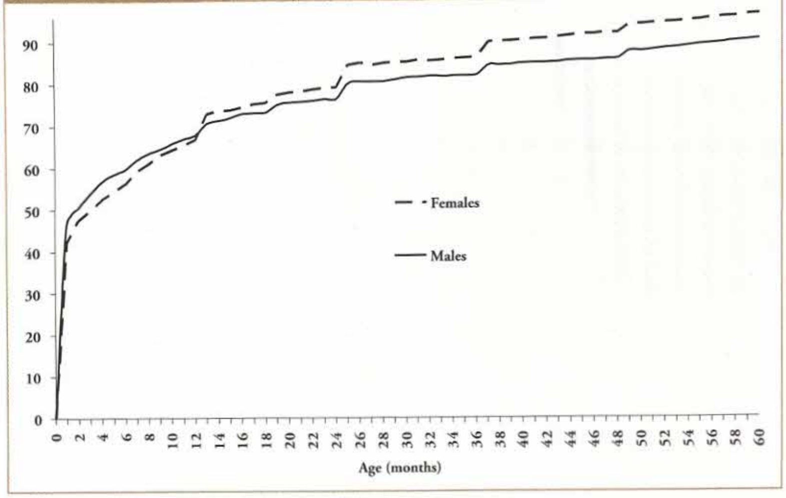
Much has been written about sex differentials in infant mortality in India. India is said to be one of the few countries in the world where females have a higher infant mortality rate than males. The NFHS-2 data do not show a significant disparity in average male and female infant mortality rates, but this in itself is evidence of parental discrimination against female infants, as one would expect the infant mortality rate for males to be well above that for females in a non-discriminatory environment. Further, the data show large gender differences in infant mortality for higher birth-order children (Table II.1). Girls of birth order 4 or more experience significantly higher rates of infant mortality than boys of similar birth order (84 versus 75), with this difference being larger in the non-poor states than in the poor states.

Child mortality between the ages of one and five is also significantly greater for females than for males. A girl in India is 40% more likely to die between her first and fifth birthdays than is a boy. Thus, child mortality would drop by 20% if girls had the same mortality rate as boys between the ages of 1 month and 5 years (Victora et al. 2003). Figure II.25, which plots the monthly mortality rate for children by sex (from the NFHS-2 data), indicates that while the probability of death is greater for males than for females until age one, the reverse is true from ages one to five. Parental neglect toward girls — symptomatic of the generally low social status of women — is an important cause

Table II.1 : Infant mortality rates by child birth order, sex, and by group of states, 1994-98

	Poor States			Other States			All States		
Birth Order of Child	**Male**	**Female**	**All**	**Male**	**Female**	**All**	**Male**	**Female**	**All**
1	91	76	84	50	41	46	76	63	70
2-3	65	65	65	45	44	45	58	58	58
4 & above	79	88	83	59	71	65	75	84	80
Total	76	76	76	49	48	49	68	67	67

Figure II.25 : Mortality rate (per 1,000 live births), by age (months) and sex, 1994-98

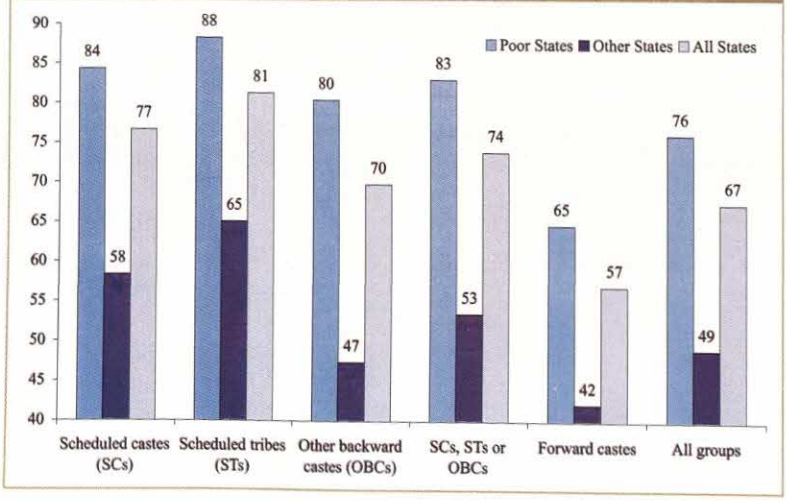


of the gender disparity in child mortality. Girls are less likely to receive adequate food allocations and medical treatment for their illnesses than boys (Das Gupta 1987, Filmer et al. 1998).

Disparity across social groups

In India, social groups, such as Scheduled Castes (SCs), Scheduled Tribes (STs), and Other Backward Castes (OBCs), have been historically under-privileged, and tend to have poorer socioeconomic indicators than the general population. The NFHS-2 data indicate that these groups have higher infant mortality rates than the general population, although there are differences among these groups as well (Figure II.26). Of the three groups, STs have the highest infant mortality, followed by SCs. Although SC/STs in the poor states have the highest absolute IMRs of any group in the country, the relative position of SC/STs vis-à-vis the non-SC/ST/OBC groups is worse in the non-poor states relative to the poor states. For instance, in the poor states, STs have an IMR that is 54% greater than that of forward castes, but this differential is only about 37% in the non-poor states.

Figure II.26 : Infant mortality rates of various social groups in poor and other states, 1994-98



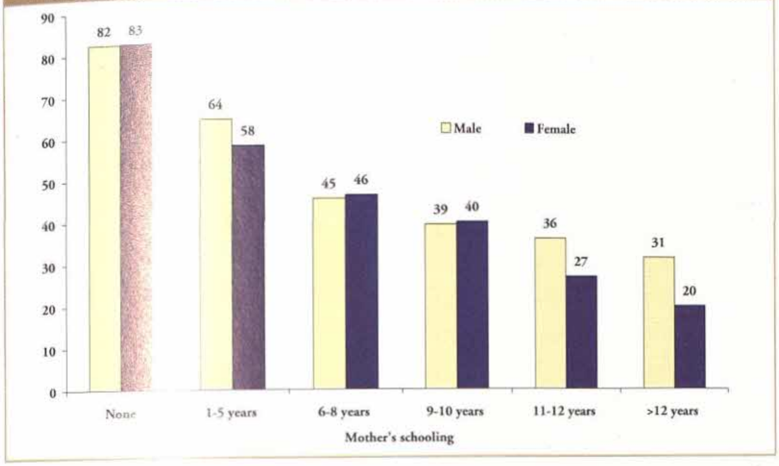
Female schooling

As is widely observed in many countries (including India), mother's schooling is strongly associated with infant mortality (Figure II.27). What is interesting is that while both male and female infants benefit (in terms of significantly reduced risk of mortality) from having their mothers even slightly schooled (i.e., 1-5 years), female infants enjoy a significant (relative) survival advantage over their male counterparts only when the mother has 11 or more years of schooling.

Rural infrastructure

Rural infrastructure can have powerful influences on health outcomes. For instance, rural roads enable easier access to health centers and referral district hospitals, thereby reducing the risk of an infant dying because of neonatal and post-neonatal infections. Access to safe drinking water and sanitation are important environmental hygiene interventions that significantly reduce the exposure of an infant to water- and vector-borne diseases and increase the probability of his or her survival. Likewise, access to electricity can also improve infant survival probabilities by improving

Figure II.27 : Infant mortality by sex and by mother's schooling, 1994-98



hygiene, cooking and health practices in the household as well as the health practices of local health providers.

The NFHS-2 data show significant association between infant mortality and access to infrastructure (Table II.2).[26] The infant mortality rate is nearly 50% greater among households without access to electricity as compared to households with electricity, although this difference is somewhat smaller in the poor states than in the non-poor states. It is not just the availability of electricity but also the regularity in its supply is associated with health outcomes. The regularity of electricity supply in a village is associated with significantly lower levels of infant mortality, although this relationship too is more predominant in the better-off states than in the poor ones.

Access to sanitation is another infrastructural intervention that is observed to have strong association with health outcomes. Households with no toilet access have an infant mortality rate that is nearly double that of households with toilet access. This pattern does not differ much across poor and non-poor states.

Government programs and health infrastructure

In the poor states, there is no discernible association

Table II.2 : Infant mortality rate, by various individual, household, child and community characteristics and by poor and non-poor states, 1994-98

Characteristic	Poor states	Other states	All states
Household has:			
No electricity	85	66	82
Electricity	64	45	55
Electricity supply in village is:			
Irregular	81	57	75
Regular	78	49	65
Household has:			
No piped water	80	54	75
Piped water	59	45	51
Household has:			
Some toilet access	49	34	42
No toilet access	84	60	78
% of villages in district having pucca road:			
50% or fewer	81	53	77
50-90%	78	52	71
>90%	59	45	51
Social group of household:			
Scheduled Caste	84	58	77
Scheduled Tribe	88	65	81
Other Backward Caste	80	47	70
SC, ST or OBC	83	53	74
Total	76	49	67

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[26] It is worth reiterating that the descriptive statistics shown in Table II.2 and similar tables throughout this report represent simple associations, not causal relations.

Table II.3 : Infant mortality rate, by village availability of government anti-poverty programs and health infrastructure and by poor and non-poor states, 1994-98

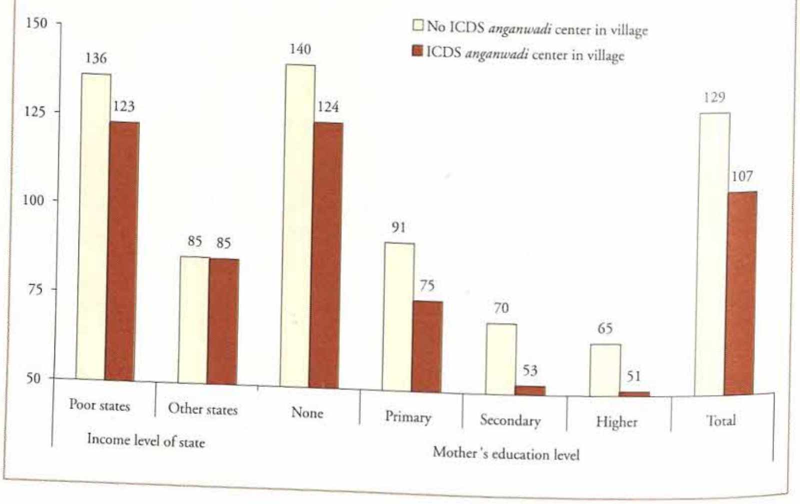
Characteristic	Poor states	Other states	All states
Government anti-poverty programs in village:			
Intensive Rural Development Program (IRDP)	76	53	68
No IRDP	76	45	67
National Rural Employment Program (NREP)	76	41	63
No NREP	76	50	68
Availability of sub health center in village			
No	82	56	76
Yes	75	52	67
All	49	76	67

between infant mortality and the presence of two large national government anti-poverty programs in a village — the Intensive Rural Development Program (IRDP) and the National Rural Employment Program (NREP) (Table II.3). However, in the non-poor states, there is some evidence that the NREP, which creates employment through rural public works, is associated with significantly lower infant mortality (17%).

In terms of health infrastructure, one of the few variables that is associated with infant mortality is the presence of a sub-primary health center in a village. Having a sub-health center in a village is associated with a reduction of 8-9% in the risk of infant mortality in both poor and non-poor states.

Given that child malnutrition is an important proximate cause of infant and child mortality, one might expect child mortality to be associated with the presence of a national program such as the Integrated Child Development Services (ICDS), which seeks to provide growth monitoring, nutritional supplementation, and early childhood education to preschool children. Since the large portion of ICDS beneficiaries are aged 3-6 years, the program is unlikely to influence infant mortality rates, except perhaps very indirectly. While the NFHS-2 did not obtain information on whether an ICDS *anganwadi* center operated in a respondent's village of residence, the NFHS-1 (conducted in 1992-93) did. Analysis of unit record data from the NFHS-1 suggests that the presence of an ICDS *anganwadi* center in a village is associated with a substantial — 17% — decline in under-five mortality rates (Figure II.28). This association holds across all levels of maternal schooling, although it is observed

Figure II.28 : Under-five child mortality rate, by presence of ICDS *anganwadi* center in village, 1988-92



only in the poor (and not in the non-poor) states.[27]

Multivariate Analysis of Infant Mortality

In order to undertake further simulations about the likelihood of India and its individual states meeting the IMR MDG, we have estimated a multivariate model of infant mortality using the NFHS-2 unit record data (at the child level).[28] The multivariate model has the advantage of controlling for several variables that may be simultaneously associated with infant mortality. The estimation results are reported in Annex Table 1, while only the broad findings of the empirical analysis are discussed here.[29]

Even after controlling for other factors associated with infant mortality, Scheduled Castes (SCs) and Scheduled Tribes (STs) have significantly higher infant mortality than Other Backward Castes (OBC) and forward castes. The differences are large; for instance, controlling for other factors, SC/STs have, on average, an infant mortality rate that is 50% higher that of forward castes. This suggests the importance of targeting socially disadvantaged groups; since a number of STs live in ST habitations, these habitations could be targeted for health interventions.

Within households, higher birth-order females face significantly higher mortality risk than lower birth-order males and females. The higher mortality of higher-order females typically arises due to their neglect by parents, typically in the provision of nutrition and medical care. These results indicate the importance of targeting health interventions to older (higher order) girls within households.[30]

The lack of access to toilets has a significant association with increased infant mortality. Households without any access to toilets experience 16% higher infant mortality than those with some type of toilet access. Surprisingly, piped water access is observed to have no significant (independent) association with the probability of an infant death, probably reflecting the fact that it is highly correlated with toilet access.[31] Another infrastructural variable — the availability of electricity — is associated with the reduction of infant mortality by 22 deaths per 1,000 live births (about 34%). Interestingly, however, irregularity of electricity supply in the village reverses the inverse association by 10 infant deaths (14%), indicating that while the availability of electricity is associated with a reduction in infant mortality, the association is much stronger for regular electricity supply. Yet another infrastructural variable — the percentage of villages in a district that are connected by a pucca (sealed) road — also is significantly associated with infant mortality decline. A one-percentage point increase in this variable is associated with a reduction in infant mortality of about 0.2%.

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[27] Of course, the inverse association between the presence of ICDS *anganwadi* centers in a village and child mortality rates may reflect the fact that *anganwadi* centers, at least at the time of the NFHS-1 survey (1992-93), were located in more affluent communities that happened to have lower child malnutrition and mortality rates. However, this possibility appears unlikely, given the design of the program.

[28] Since the dependent variable is dichotomous (viz., whether or not a child dies within 12 months of its birth), the model has been estimated by the maximum-likelihood probit method.

[29] In the probit model, we have included an explanatory variable — predicted household consumption expenditure per capita — to proxy household living standards. The NFHS-2 is a rich data set, but it has the limitation that it does not contain information on income or expenditure, both of which are widely used as measures of household welfare. Using data on household energy sources, land ownership, and household demographic characteristics (all of which are available in the NFHS-2), we have predicted monthly consumption expenditure per capita for each of the NFHS-2 households on the basis of an econometric relationship between *actual* monthly consumption expenditure and energy sources, land assets and demographic variables that was estimated with unit record data from the National Sample Survey (NSS) 55th round data (1999-2000). The distribution of predicted monthly consumption expenditure per capita in the NFHS-2 sample was observed to be very similar to that in the NSS 55th round sample.

[30] Rahman et al. (2003) also find that parity and birth spacing have strong associations with child mortality in West Bengal, Bihar, Uttar Pradesh, and Rajasthan. This means that family planning interventions that result in fewer and better-spaced births will also reduce child mortality.

[31] A study by Jalan and Ravallion (2003) that attempted to estimate the impact of piped water access on diarrhea prevalence and duration among children under five in rural India, using a propensity score-matching methodology, found that while there were significant health gains overall from access to piped water, there appeared to be no gains for the poorest 40% of children.

An interesting — and unusual — finding from the analysis is that household living standards, as proxied by the log of household consumption expenditure per capita, have a perverse positive association with infant mortality, once there is control for schooling and other characteristics of the household.[32] Likewise, log of per capita state gross domestic product, used as a proxy for the level of development in a state, also has a perverse positive association with infant mortality when there is control for infrastructure variables and public spending on health. It is difficult to explain these counter-intuitive results, but one possibility is that the typically-observed inverse association between income and infant mortality in fact reflects the association between infant mortality and parental schooling, infrastructure (e.g., electricity availability), and housing quality. Once there is control for these variables, the association between infant mortality and income or living standards becomes insignificant or even negative.

Public spending on health and family welfare per capita is observed to have a significant inverse association with infant mortality, with the negative association being slightly weaker among the poor states.[33]

Tetanus immunization and antenatal care coverage also have sizeable associations with reduced infant mortality.[34] The risk of infant death is lower by 28% when a mother has been immunized against tetanus and by 15% when a mother has received some form of antenatal care during her pregnancy. After controlling for tetanus immunization and antenatal care, professional medical attendance at the time of delivery does not appear to be significantly associated with infant mortality.[35]

As in other studies from around the world, maternal schooling is observed to be significantly and inversely associated with infant mortality. The estimates suggest that each additional schooling year of a mother is associated with a reduction in infant mortality of about 4%. Maternal schooling has a much stronger association with infant mortality reduction than schooling of the household head.[36]

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[32] Following convention, the consumption expenditure, state government health expenditure and per capita gross state domestic product variables are transformed to natural logs before including them in the probit model. However, the use of the original variables, as opposed to the transformed natural logs, does not change the basic results reported here.

[33] As an alternative, the probit equation was estimated with a set of 23 state dummy variables, which replaced all the state-level variables (e.g., log of gross state domestic product per capita, log of state government health expenditure per capita, and the latter variable interacted with a dummy variable for the poor states.) Although the full set of state dummy variables was significant at the 5% level, the explanatory power of the regression, as measured by a pseudo R-squared measure, only increased from 0.07 to 0.08 with the substitution of the state fixed effects for the three state-level variables. This suggests that the state fixed-effects model is not a superior model to the one reported here in terms of goodness-of-fit.

[34] Tetanus immunization and antenatal care are generally household choice variables and therefore inappropriate candidates to be explanatory variables in an infant mortality regression. However, in the Indian context, both of these variables are heavily (if not exclusively) influenced by availability (or supply) considerations. The most important reason why a large number of pregnant women do not obtain tetanus shots or any form of antenatal care is that such care is simply not readily available in most villages. We therefore implicitly treat both of the variables as "access" — not utilization — variables.

[35] The lack of significance of this variable does not necessarily mean that medical attendance at birth is not important. The result most likely reflects the fact that antenatal care and medical attendance at birth are strongly correlated with each other, resulting in the influence of medical attendance at birth being picked up by the antenatal care variable.

There have been relatively few studies of the correlates of infant mortality in India, especially using recent unit record data. A study by Hughes and Dunleavy (2000) using the NFHS-1 data (for 1992-93) focused largely on the association between household environmental variables, especially the use of clean cooking fuels, and infant mortality. The study observed a significant association between infant mortality and the use of kerosene or bottled natural gas (as opposed to cow dung or wood) for cooking. Many of Hughes and Dunleavy's other results are similar to those reported here. Bhargava (2003) also uses the earlier NFHS-1 data, but only for Uttar Pradesh. His results too are broadly comparable to those reported here using the NFHS-2 data for all of India. Bhargava focuses on the differential association between the presence of older boys and girls in the household and the mortality risk of children, and finds that the presence of an older girl is associated with a larger reduction in infant mortality of a child. Finally, Arulampalam and Bhalotra (2002) use the more recent NFHS-2 data, but only for three states (Uttar Pradesh, West Bengal and Kerala), and focus on the association between the death of a previous child in a household and the mortality risk faced by the index child. They find that the death of the previous child is associated with a significantly enhanced risk of mortality for a subsequent child. None of the three studies includes as wide a range of policy variables as that included in this analysis; nor do they undertake any simulations of the likely impact of different policy instruments on mortality outcomes.

Simulations to 2015

Based on the multivariate probit model estimated above, we have undertaken simulations of the infant mortality rate for the poor and the non-poor states under different intervention scenarios.[37] Since the explanatory power of the estimated probit model is low, the simulations discussed below should be treated as indicative of possible trends in the future — not as definitive predictions.[38] The simulation results are shown in Table II.4.[39] If the poor states were simply brought up to the national averages in terms of coverage of sanitation, road access, electricity, antenatal care, tetanus immunization, female schooling, and public spending on health and family welfare per capita, the cumulative reduction in the infant mortality rate would be of the order of about 11.8 infant deaths per 1,000 live births (or 16%). If the magnitude of the proposed interventions were scaled up so as to bring the poor states to the mean level of the non-poor states, the cumulative reduction in the infant mortality rate would be greater — about 36.5 infant deaths per 1,000 live births (or 48%). It is thus clear that a combination of interventions can have a strong association with infant mortality reduction in the poor states.

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[36] Note that the association between infant mortality and maternal schooling implied by the estimated equation may not reflect causality, since there is no control for unobserved endowments in the relationship. For instance, Behrman and Rosenzweig (2002) find that a positive significant association of mother's schooling on child schooling in cross-sectional estimates becomes significantly negative if data on identical twins are used to control for unobserved genetic and family background endowments, perhaps because more-schooled women — holding constant ability — spend more time in the labor force and less in child care. The available data do not permit extensive exploration of such possibilities.

[37] As noted in chapter 1, the simulations undertaken throughout this report are based on inferences of one-way causality from the independent variables to the dependent variables (viz., infant mortality, child malnutrition, school enrollment, etc.).

[38] The pseudo R-squared measure for the estimated probit model is 0.07, suggesting that the included explanatory variables 'explain' only 7% of the cross-sectional variation in infant mortality. It is not uncommon, however, for econometric models estimated with cross-sectional data to have low explanatory power, in large part due to the importance of unobserved individual and household heterogeneity and idiosyncratic 'shocks' in determining household outcomes. The explanatory power of regression models typically declines with sample size.

[39] The simulations were done by multiplying desired changes in the values of the right-hand side variables to the marginal effects reported in Annex Table 1. The resulting changes in the probability of an infant death, when multiplied by 1,000, can be interpreted as the projected declines in the infant mortality rate from the base year.

Table II.4 : Projected decline in the infant mortality rate with various interventions in the poor and non-poor states

Type of Intervention	*Bringing the poor/non-poor states to the level of*			
	National average	*Non-poor states' average*	*50% coverage*	*100% coverage*
No access to toilet (%)	-0.8	-2.4	-3.5 (-1.1)	-10.1 (-7.7)
Access to regular electricity supply (%)	-1.2	-2.5	-4.8 (-2.4)	-15.7 (-13.3)
Access to irregular electricity supply (%)	-1.0	-3.6	-4.4 (-0.8)	-10.5 (-6.9)
Female schooling (years)	-1.9	-5.8	-10.6[a] (-4.8)[a]	-14.3[b] (-8.5)[b]
Government expenditure on health and family welfare per capita (Rs.)	-3.2	-10.9		
Percent of villages in district connected by a pucca road (%)	-1.5	-4.7		-9.6 (-4.9)
Coverage of tetanus toxoid immunization for mother (%)	-1.1	-3.4		-5.6 (-2.2)
Antenatal care coverage (%)	-1.1	-3.2		-4.5 (-1.3)

Notes: Figures in parentheses refer to the mortality reduction obtained in the non-poor states.

[a] The assumed coverage level in this case is 6.5 years of schooling.

[b] The assumed coverage level in this case is 8 years of schooling.

Empty cells indicate no significant reduction in infant mortality due to the specific intervention being considered.

Figure II.29 shows the projected decline in the infant mortality rate in the poor states with all the seven interventions noted above being pursued simultaneously and gradually to 2015. The scope and magnitude of the assumed interventions, which are shown in Table II.5, are merely meant to illustrate the likely reduction in infant mortality under one possible scenario. There is obviously no suggestion that the assumed interventions will indeed take place, and, even if they do,

Figure II.29 : Projected decline in the infant mortality rate in the poor states under different intervention scenarios, 1998-2015

(graph shows comulative effect of each additional intervention)

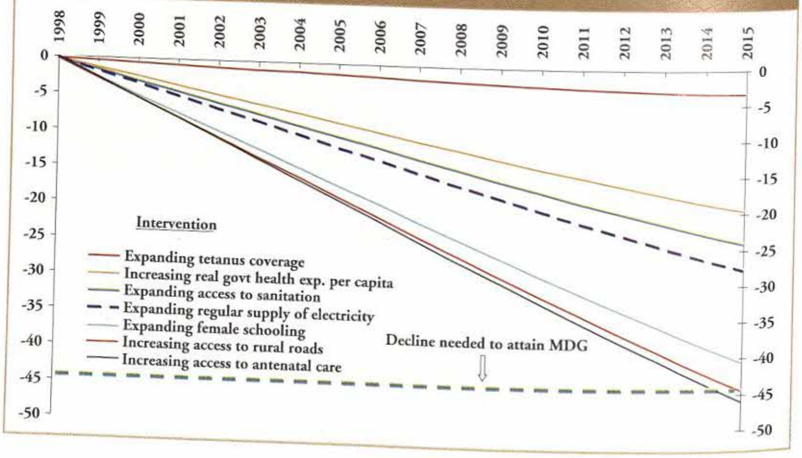

Table II.5 : Assumptions about various interventions to reduce the infant mortality rate in the poor states, 1998-99 to 2015

Intervention	Starting value in 1998-99	Assumed change per year	Ending value in 2015
Female schooling (years)	2.7	0.3	7.8
Per capita government expenditure on health and family welfare (Rs.)	95	4%	185
Population coverage of regular electricity supply (%)	27.7	1% point	44.7
Population coverage of tetanus toxoid immunization for pregnant women (%)	70.0	1% point	87.0
Coverage of antenatal care (%)	55.5	1% point	72.5
Village access to pucca roads (%)	59.5	1% point	76.5
Population with no access to toilets (%)	76.5	-2% points	42.5

whether the interventions will proceed at the pace assumed in Table II.5.

While each of the interventions is observed to contribute to the reduction in infant mortality, it is obvious from the figure that two interventions — additional public spending on health and family welfare and increased schooling of mothers — are most strongly associated with infant mortality reduction. With the full 'package' of interventions, the infant mortality rate in the poor states is projected to decline by 46 infant deaths per 1,000 live births by 2015 — to a level of 29 infant deaths per 1,000 live births. This would be just below the MD goal of 31 deaths per 1,000 live births for the poor states. This suggests that while attaining the infant mortality MDG will be challenging in the poor states of the country, it will not be impossible, as long several mortality-reducing interventions are pursued simultaneously.

The finding on the positive association between increased government health expenditure and infant mortality needs two qualifications. First, merely increasing health spending will not be enough; the composition, quality, and effectiveness of public spending is as important as raising its quantity. This is especially true of the poorer states in India, which are plagued with the most serious problems of governance and service delivery in the health (and other) sectors. Serious attention needs to be paid to making government health services work in these states, especially for the poor. As the World Development Report 2004 points out, this is a complex and difficult task that entails creation of the right institutions and incentives in the system to improve service delivery, such as devolving responsibility for service delivery to local governments and communities (see Box II.2), contracting out certain types of service delivery to the non-government sector, and empowering consumers to demand better services from government health facilities.

Second, the finding that public spending on health is associated with infant mortality reduction in the poor states is of little use to policy makers. Identifying the type of health interventions on which to spend resources in the poor states is of

Box II.1: Home-Based Neonatal Care: Results from a Field Trial in Rural Maharashtra

Nearly two-thirds of infant deaths in India occur in the first month of birth. Thus, substantial reductions in infant mortality can take place only with a reduction in neonatal mortality. It is believed that the large majority of neonates in India die due to sepsis (typically, septicaemia, meningitis, and pneumonia). While the most efficient way to treat ill neonates is to admit them to hospitals, specialized hospital care is either inaccessible to the rural population or prohibitively expensive.

It was in response to this need that Bang and his colleagues developed a package of home-based neonatal care, including the management of sepsis, and tested it in a three-year field trial from 1995 to 1998 in 39 villages in Gadchiroli district in Maharasthra. Gadchiroli is a 'backward' district in which rice cultivation and forestry are the main sources of income and infrastructure (viz., roads, communications, school facilities, and public health facilities) is poor. The team identified 39 intervention villages, and introduced neonatal care to these villages in a sequential manner from April 1995 to March 1998. In the first year, female village health workers listed pregnant women in the village, collected data via home visits in the third trimester, observed labor and neonates at birth, and visited the home frequently for 28 days after birth to weigh the child and observe neonatal morbidity. Data from the first year were used to plan further interventions. In the second year of the study, the female health workers were trained in and began providing home-based management of neonatal illnesses. The care typically consisted of clinical diagnosis of sepsis and subsequent treatment with an injection of Gentamicin and Co-Trimoxazole syrup. In the third year of the intervention, health education of mothers and grandmothers about the care of pregnant women and neonates was added to the program. By the third year of the intervention, 93% of neonates in the treatment area were receiving home-based care.

The team had selected 47 control villages in an adjacent area of the same district, and had collected baseline data in both treatment and control villages. An evaluation done after the third year of the intervention indicated net reductions of 62%, 46% and 71% in neonatal, infant and perinatal mortality rates in the intervention area as compared to the control area. In absolute terms, the infant mortality rate in the treatment area fell from 75.5 deaths per 1,000 live births in the baseline period (1993-95) to 38.8 in 1997-98, while it merely declined from 77.1 to 74.9 in the control villages over the same period. Case fatality in neonatal sepsis declined from 16.6% before the intervention to 2.8% after treatment by the village health workers. The cost of home-based neonatal care worked out to about US$5.30 per neonate, of which $3.80 was the recurrent cost.

The Bang experiment shows that it is possible to halve the infant mortality rate in populations with poor economic and nutritional status and with low female literacy by providing inexpensive health education and home-based neonatal care.

Source: Bang et al. (1999).

much greater policy interest. The evidence in this report, as well as the results of previous studies, suggest that a package consisting of expanded child and maternal immunization, antenatal care coverage, nutritional supplementation (including promotion of exclusive breast-feeding), and home-based neonatal services (including treatment of pneumonia) (see Box II.1 below) is likely to be a high-impact intervention strategy (Jones et al. 2003).

Annex II.1: Infant Mortality, Government Health Expenditure, and Per Capita Income across States, 1980-99

Several studies have tried to estimate the relationship between health outcomes and public spending on health using cross-country data (Anand and Ravallion 1993, Filmer and Pritchett 1999, Gupta et al. 1999, Bidani and Ravallion 1997, Rajkumar and Swaroop 2002). These studies have reported mixed results. Filmer and Pritchett find insignificant association between public spending and infant mortality. However, Gupta et al. find public spending on health to have strong associations with infant and child mortality reduction. As Gupta et al. disaggregate mortality by poverty status, they are able to estimate the differential association of public spending with the

Box II.2: Is Decentralization of Health Services Associated with Child Mortality?

Well before 1992, the states of Maharashtra and Gujarat had reassigned numerous activities, including the administration of primary health care, to elected rural bodies at the district level (the *zilla parishads*). These bodies were also provided with the flexibility to recruit certain classes of employees (typically, low level). Even though higher-level employees were state employees on deputation to the local bodies, they were administratively under the control of the *zilla parishad*. Members of Parliament and state legislatures were kept out of the membership of the local bodies. Finally, funds for administering health care activities were directly transferred to these bodies.

Karnataka was another state that introduced decentralization in the mid-1990s. As in Maharashtra and Gujarat, entire departments (including primary education and health care) and associated expenditures were transferred to local bodies at the village and district levels. In Karnataka, unlike as in Maharashtra and Gujarat, planning departments were also moved under the control of the local bodies. A state finance commission oversaw the division of resources at the state level between the state government and the local bodies.

West Bengal was yet another state which made some progress toward decentralized governance before 1992. West Bengal village *panchayats* were actively involved in executing a number of programs such as mass literacy campaigns, irrigation schemes, and employment generation.

The passage of the historic 73rd and 74th constitutional amendments — viz., the local government or Panchayati Raj Act of 1992 — by the Indian Parliament gave fresh impetus to the decentralization efforts of various states. The Act gave control to elected village and urban councils (*panchayati raj* institutions or PRIs) over a wide range of social and developmental activities of governments, including education, health care, nutrition, and safe drinking water and sanitation. According to the Amendment, PRI members were to be elected (with guaranteed representation of women and minorities), and PRIs were to be funded by 'block grants' from the state and central governmental budgets as well as from local taxes which they have the authority to levy.

While all states have passed conformity legislation in line with the Constitutional changes of 1992, and most have held elections and set up state finance commissions for devising a framework for devolving funds to local bodies, some states, such as Kerala and Madhya Pradesh, have gone further and moved entire departments to the control of the local rural bodies and involved them in the development planning process. Kerala has moved toward making large transfers of funds to local bodies, while *panchayats* in Madhya Pradesh have the right to demand funds for schools and hire their own teachers.

An econometric study of over 1,500 villages, based on a nationwide survey of 33,230 households in 1994, found that after controlling for mean household income, income inequality, access to transport and availability of health infrastructure, under-five mortality rates in villages were significantly lower in states where health services had been significantly decentralized (viz., Gujarat, Maharashtra, Kerala, Karnataka, and West Bengal) relative to states where there had been no such move (Mahal et al. 2001).

Source: Mahal et al. (2001).

mortality rates of the poor and the non-poor. They find that the association between child deaths and public spending on health is twice as strong for the poor as for the non-poor. Anand and Ravallion and Bidani and Ravallion also obtain a strong inverse association between infant mortality and public expenditure on health. Rajkumar and Swaroop interacts public spending on health with a governance index and finds that public spending on health is significantly associated with child and infant mortality reduction, but only for countries with good governance (as measured by a corruption index and a variable reflecting the 'quality of the bureaucracy').

Virtually all of these studies that have explored the association between health outcomes and public spending have used cross-country data (either for a single year or over several periods); we are not aware of any study that has used sub-national data to analyze this relationship. Cross-country analyses are plagued by issues of comparability of expenditure data across countries; for instance, there are large variations in what constitutes health expenditures and in the level of government — local, state or federal — that is responsible for public spending on health. In contrast, there is greater comparability in public spending on health across states within a single country.

We have used twenty years of state-level data on infant mortality rates (IMRs), real gross state domestic product per capita (GSDP), and real public spending on health to analyze the association between infant mortality on the one hand and public spending and economic growth on the other.[40, 41]

The results of this analysis are reported in Annex Table II.1 below. OLS estimates (shown in columns 1 and 2) indicate a very strong association between infant mortality and government health expenditure even after control for per capita GSDP and a time trend, with a one percent increase in government health spending per capita being associated with a one percent decline in infant mortality. However, when there is control for unobserved heterogeneity across states — in the form of time-invariant state fixed effects — in the model (columns 3-5), the magnitude of the association declines sharply and, in the case of the regression with a time trend (column 5), becomes insignificant.

Unfortunately, time-series data on other covariates of infant mortality, such as adult female literacy, are simply not available at the state level for the period 1980-99. To rule out the possibility that the association between infant mortality and government health expenditure per capita could be due to the omission of female literacy from the model, we have calculated state-level averages of the adult female literacy rate from four rounds of the National Sample Survey — for 1983-84, 1987-88, 1993-94 and 1999-2000. The inclusion of adult female literacy means that the infant mortality regression can only be estimated for these four years, which reduces the sample size from 278 observations to merely 56.

To explore whether the association between infant mortality and public spending varies across different levels of per capita income, we have interacted GSDP per capita with government health expenditure as well as with adult female literacy in the infant mortality regression. The results (shown in columns 7 and 8 of Annex Table II.1) indicate that the inverse association between infant mortality and per capita public spending becomes weaker — while that between infant mortality and adult female literacy becomes stronger — at higher levels of per capita GSDP. Indeed, the estimated coefficient on government health expenditure per capita is negative only at very low levels of per capita GSDP (about Rs. 6,050 in 1993-94 prices). While two-thirds of the states fell under this threshold for the earliest year of the sample (1980), fewer than 10% of the states do so for the latest year (1999).

On the other hand, the coefficient on adult female literacy in the estimated infant mortality equation becomes negative only beyond a threshold per capita GSDP level of Rs. 10,500 (again 1993-94 prices). This means that while government health expenditure per capita is associated with infant mortality for very poor

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[40] Data on government health expenditure were obtained from detailed budget demand documents of individual states. Expenditure on health includes spending on public health; urban and rural health services; medical education, training and research; general administration; and family welfare (i.e., population programs, including maternal and child health). It includes expenditure incurred by a state out of its own revenues as well as central government health allocations to that state.

[41] A state-level regression of infant mortality on public health spending is predicated on the assumption that public spending is not endogenously distributed across states (Rosenzweig and Wolpin 1986). Such an assumption may not always hold, especially if government health expenditures are allocated across states based on health conditions. However, the inclusion of state fixed effects in the regression effectively controls for endogenous program placement. We allow for a central planner to distribute public spending on health across states according to an unobserved health attribute; in other words, states that have innately high mortality may spend more on health than those having innately low mortality. Since the fixed-effects model purges the unobserved (time-invariant) health attribute from the model, it effectively addresses the endogenous program placement problem.

Annex Table II.1: Fixed-effects, log-linear regression of infant mortality rate, pooled data for 1980-1999 across Indian states

	OLS		Fixed effects			Fixed effects with female adult literacy*		
Independent variable	Coeff (t-ratio) (1)	Coeff (t-ratio) (2)	Coeff. (t-ratio) (3)	Coeff. (t-ratio) (4)	Coeff. (t-ratio) (5)	Coeff. (t-ratio) (6)	Coeff. (t-ratio) (7)	Coeff. (t-ratio) (8)
Ln real gov't health & family welfare expenditure. per capita (G)	**-1.042** (-7.45)	**-1.014** (-7.33)	**-0.138** (-1.91)	-2.317 (-3.12)	0.437 (0.61)	-0.020 (-0.10)	-5.657 (-2.26)	-5.685 (-2.30)
Ln real gross state domestic product per capita (Y)	0.164 (1.44)	**0.248** (2.14)	**-0.673** (-11.34)	**-1.782** (4.68)	0.128 (0.33)	**-0.550** (-3.09)	-1.487 (-0.92)	-1.006 (-0.95)
Ln G x Ln Y				**0.248** (2.95)	-0.037 (-0.47)		**0.707** (2.30)	**0.653** (2.39)
Ln adult female literacy (F)						-0.259 (-1.59)	**4.891** (2.63)	**5.011** (2.76)
Ln F x Ln Y							-0.460 (-1.56)	**-0.541** (-2.57)
Ln F x Ln G							-0.152 (-0.40)	
Time trend (t)		**-0.013** (-2.90)			**-0.031** (-9.24)	**-0.029** (-2.77)	**-0.036** (-2.77)	**-0.036** (-2.85)
Intercept	**7.242** (11.90)	**6.505** (9.98)	**10.904** (32.71)	**20.631** (6.22)	3.043 (0.88)	**10.174** (11.11)	14.704 (1.32)	12.415 (1.31)
Number of observations	278	278	278	278	278	56	56	56
F-test for model	68.31	44.41	249.32	173.98	194.00	29.05	19.76	23.58
R-squared	0.33	0.35	0.94	0.94	0.95	0.94	0.96	0.96
F-test for state effects			193.15	198.89	261.63	15.19	13.89	18.61

Notes: All regressions (with the exception of those marked *) use pooled data across 14 states and 20 years. Dependent variable is log of infant mortality rate. Data are obtained from various issues of the Sample Registration Surveys (SRS), state government budget demand documents, and CSO statistics on GSDP of states. All values are in constant 1993-94 Rupees (using state-specific GSDP deflators). Standard errors are corrected for heteroscedasticity using the Huber-white method. Figures in bold are statistically significant at the 10% or lower level.

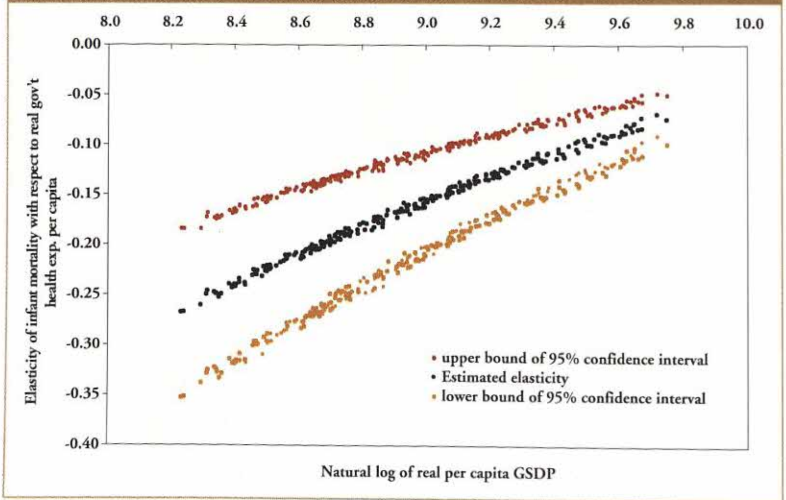
*Data on female literacy are available only for 1983-84, 1987-88, 1993-94 and 1999-2000, so these regressions are restricted to these four years.

states, adult female literacy is not. On the other hand, at higher levels of per capita income, there is an association of infant mortality with adult female literacy but not with public spending on health.

Finally, we have attempted to estimate a non-parametric relationship among the three variables for which continuous time-series data are available over the period 1980-99 (viz., infant mortality, government health expenditure per capita, and GSDP per capita). The non-parametric regression allows for complete flexibility in the estimated relationship and includes single-year dummy variables and state fixed effects. It also allows us to calculate the 95% confidence interval of the estimated elasticity at varying levels of per capita GSDP. The implied elasticities of infant mortality with respect to government health expenditure per capita are shown in Annex Figure II.1. The results indicate that (i) the association between infant mortality and public spending on health per capita is significant and negative at all levels of per capita GSDP income, and (ii) the association weakens considerably (even though remaining significantly different from zero) at higher levels of state GDP per capita.

Thus, there is certainly some evidence of an inverse association between infant mortality and public spending on health, but it is not very robust to alternative specifications. The most general econometric specifications seem to suggest that public spending on health matters, but only for the very poorest states. At the same time, the finding that adult female literacy does not matter for these states — but does for the better-off states — is troubling.

Annex Fig II.1 : Estimated elasticity of infant mortality with respect to real govt. health expenditure across states, 1980-99, by level of state GDP per capita (non parameter kernel estimates with control for state fixed effect and annual year dummies)



There is some evidence in the existing literature to indicate that public spending on health matters more to health outcomes for the poor than the non-poor. For instance, Bidani and Ravallion (1997) consistently find an impact of public spending for the poor but not for the non-poor. Likewise, Gupta et al. (1999) find a strong inverse association between child deaths and public spending for the poor than for the non-poor. The finding that the inverse association between infant mortality and real government health expenditure per capita is stronger for poor states relative to non-poor states may seem counter-intuitive, given the large observed inefficiencies and leakages in government health spending in the poor (and poorly-governed) states of India. However, the association between infant mortality and public spending may be stronger for the poor than the non-poor states for two reasons. First, the better-off states with low infant mortality have a larger proportion of ifant deaths occurring during the neonatal period. On the other hand, the typical (and relatively inexpensive) child survival interventions have a greater impact on bringing down deaths in the post-neonatal than in the neonatal period. Consequently, it is much easier to bring down infant mortality rates in the poor, high-mortality states with proven, low-cost, post-neonatal interventions, such as child immunizations and oral rehydration therapy. In the better-off (and low-mortality) states, however, neonatal deaths constitute a larger proportion of total infant deaths. Reduction of neo-natal deaths typically requires more expensive interventions, such as professionally-attended deliveries or deliveries in institutions as well as post-delivery and emergency hospital-based care.[42]

Secondly, the smaller health impact of government health expenditure in the better-off states may reflect the increasing role of the private sector in providing health inputs at higher income levels. In the poor states not only is the private sector in health more limited in scope, but complementary household inputs into health production, such as nutrition and good hygiene, are also typically lacking. As a result, the public sector and public spending on health assume far more important roles in determining health outcomes than in the non-poor states. However, as per capita incomes in a state increase, nutrition and hygiene improve, as does the supply of private health providers, all of which diminish the relative importance of government health expenditure.

However, these results should not be construed as a license to simply increase government health expenditure in the poor states, because they do not consider the counter-factual — viz., the improvements in health outcomes that would occur if the quality of government health expenditures were simultaneously improved via greater accountability in service delivery and better governance. All that these results indicate is the need for a state-stratified mortality-reduction approach, with the appropriate infant mortality-reducing interventions, such as expanded immunization, antenatal care, nutritional supplementation (including promotion of exclusive breast-feeding), and home-based neonatal services, being targeted to the poor states via an effective and accountability-based delivery system (see Jones et al. 2003).

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[42] Although neo-natal mortality reduction typically requires hospital-based care, it is possible to provide a relatively inexpensive package of home-based neonatal services, as shown by a highly-successful field trial in Maharashtra in 1995-98(see Box II.1 for a detailed description of the intervention).

Child Malnutrition

Reduction of child malnutrition is another MDG related to an improvement in child welfare.[43] Child malnutrition significantly increases the risk of infant and child death, with some estimates suggesting that child malnutrition is responsible for half or more of child deaths in the developing world.[44] The NFHS-2 data analyzed in the previous chapter showed a strong relationship between under-five child mortality rates and child underweight rates across the various regions of India (see Figure II.22 in Chapter 2, Section G). There is also a large body of evidence from around the world relating under-nutrition in childhood to lower levels of school performance, cognitive development, health, and, ultimately, to lower levels of labor productivity in adulthood. Thus, the economic and human costs of child malnutrition in India are likely to be very high.[45]

The millennium development goal is to reduce the percentage of underweight children by one-half between 1990 and 2015.[46] For India, this would imply a reduction in the child underweight rate from 54.8% in 1990 to 27.4% in 2015.[47]

Patterns and Trends

Levels

Child malnutrition rates in India are extraordinarily high. The NFHS-2, which is the most recent household survey containing information on child nutrition, indicates that nearly one-half of children aged 0-35 months are underweight or stunted[48], which translates into approximately 37 million malnourished children. About 18-23 percent of children are severely underweight or stunted in the sense of being more than three standard deviations below the relevant NCHS standards. This suggests that Indian children suffer from short-term, acute food deficits (as reflected in low weight-for-age) as well as from longer-term, chronic under-nutrition (as manifested in high rates of stunting).[49]

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[43] Another important form of malnutrition that is not pursued in this report is inadequate consumption of micronutrients, such as Vitamin A, iron and iodine.

[44] For instance, based on worldwide evidence, Pelletier and Frongillo (2002) estimate that a 5 percentage point reduction in the prevalence of low weight-for-age could reduce child mortality by about 30% and under-5 mortality by 13%.

[45] The World Bank (1998) suggests that the cost of undernutrition in India is at least US$10 billion annually in terms of lost productivity, morbidity and mortality.

[46] While the nutrition MDG is based on the weight-for-age indicator, it should be recognized that there are other important indicators of child malnutrition. Weight-for-age is an indicator of both short- and long-term malnutrition. Height-for-age or stunting is a better indicator of long-term (cumulative) malnutrition, while weight-for-height or wasting is generally considered the appropriate indicator for tracking short-term fluctuations in nutritional status.

[47] The most reliable estimate is available from the NFHS-1 for 1992-93. The rate shown for 1990 is projected from the change observed between 1992-93 and 1998-99.

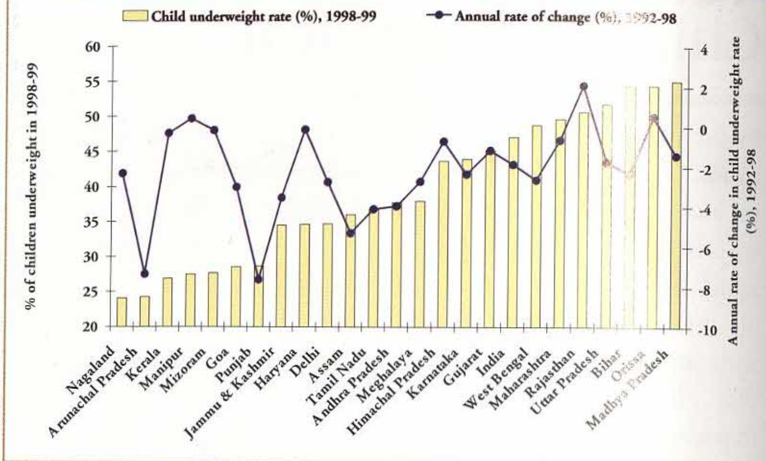
[48] As in the literature, a child is considered underweight when his or her weight-for-age is more than two standard deviations below the NCHS reference weight. A child is stunted when his or her height-for-age is more than two standard deviations below the NCHS reference. Severe underweight and stunting occur when the relevant nutrition indicator is more than three standard deviations below the NCHS reference.

[49] Wasting rates (i.e., low weight-for-height) are significantly lower than underweight or stunting rates, but this is typically the case in most low-income countries.

Trends

Both the NFHS-1, conducted in 1992-93, and the NFHS-2, conducted in 1998-99, obtained information on child anthropometry. A comparison of the estimates of these two surveys indicates a modest decline of about 11% (from a rate of 52.7% to 47%) during the 6-year period — amounting to an annual rate of decline of 1.9%. In contrast, underweight rates in neighboring Bangladesh fell from 68% in 1992 to 51% in 2000 — an annual rate of decline of 3.6% (World Bank 2003). In Vietnam, the child underweight rate fell from 49% in 1993 to 36% in 1998 — an annual rate of decline of 6.1% (World Bank 1999)! India thus appears to be an underperformer in reducing child malnutrition during the 1990s.

Figure III.1: Percent of children aged 0-35 months who are underweight, 1998-99, and annual % change in this rate between 1992-93 and 1998-99, by state



Interstate Variations

An average child underweight rate of 47% masks wide variations in child malnutrition across states. Child underweight rates vary from a low of 24-28% in the Northeastern states and Kerala to 51-55% in the states of Bihar, Rajasthan, Uttar Pradesh, Madhya Pradesh, and Orissa (Figure III.1). Likewise, the decline in child under-weight rates over time has also varied greatly across states. In Punjab, for instance, the child underweight rate fell at an annual rate of 7.6% between 1992-93 and 1998-99, while Rajasthan saw an increase of 2% per annum in the child underweight rate during the same period. Based on 1992-93 and 1998-99 values, Figure III.2 shows the 2015 MD goals for each of the states.

Although the proportion of children aged 0-3 years in India who were underweight declined from 52.7% in 1992-93 to 47% in 1998-99, the absolute number of underweight children hardly changed over this period because of a large increase in the population of children aged 0-3. Indeed, only about a quarter million fewer Indian children aged 0-3 were underweight in 1998-99 as compared to 1992-93. There were wide variations in the absolute decline in the number of underweight children across states. Tamil Nadu and Andhra Pradesh each saw declines in the absolute number of underweight

Figure III.2 : Child underweight rate MDGs by state, 2015 (% of children 0-35 months underweight)

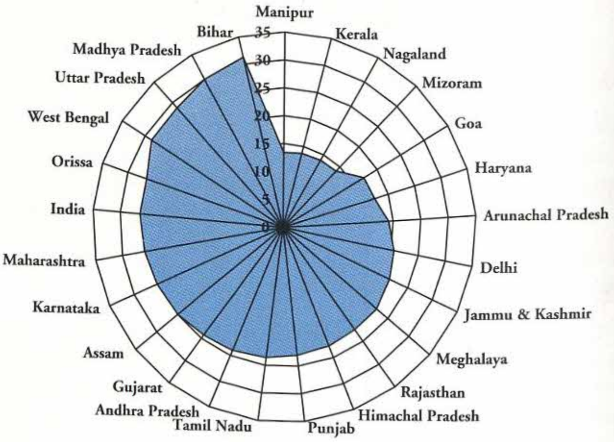
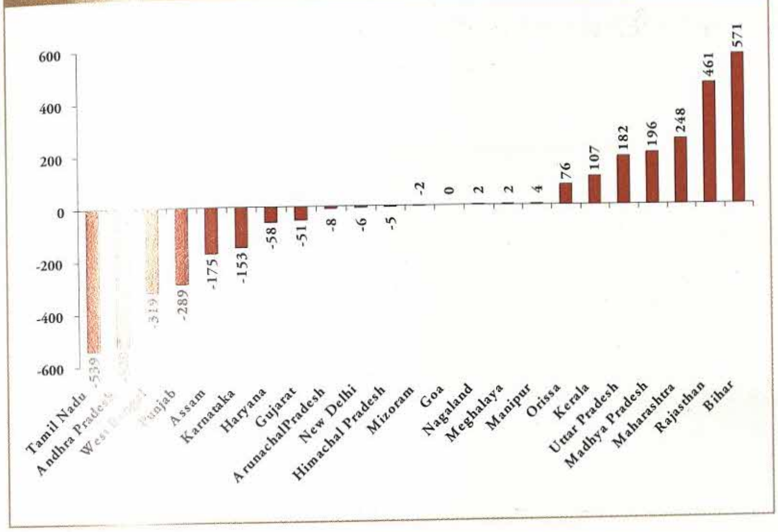


Figure III.3 : Change in absolute number of underweight children 0-35 months of age between 1992-93 & 1998-99, by state ('000 children)



children of about 0.5 million, but Rajasthan and Bihar saw an increase of 0.5 million each in the number of underweight 0-3 year olds (Figure III.3). Uttar Pradesh and Madhya Pradesh each recorded an increase of about 0.2 million underweight children aged 0-3 during the same period.

Figure III.4 suggests that there is no systematic association between the initial level of child malnutrition in 1992-93 and the rate of decline in malnutrition between 1992-93 and 1998-99. Nagaland, which had a child underweight rate of only 27.7% in 1992-93, experienced an annual rate of decline of 2.3% over the following 6 years — the same rate of decline experienced by Bihar, which began with a much higher child underweight rate of 62.6% in 1992-93.

Is child malnutrition related to living standards? The cross-state data suggest an inverse, albeit not perfect, association between the child under-weight rate and gross state domestic product per capita (Figure III.5). That Kerala emerges as a positive outlier — having a much lower child underweight rate than would be suggested by its per capita income — is no big surprise, but the fact that Gujarat and Maharashtra have significantly higher child underweight rates relative to their per capita income is surprising. On the other hand, Andhra Pradesh, which is a middle-income state, has a lower child underweight rate than would be predicted by its gross state domestic product per capita. This suggests that cultural and social — not just economic — factors have an important role to play in determining child malnutrition in India.

Public Spending on Nutrition

Much of the public spending on child nutrition in India takes place on the Integrated Child Development Services program. This program consists of *anganwadi* centers (AWCs) in each village, typically staffed by a village woman with 5-8 years of schooling and an assistant. The *anganwadi* worker receives a cash income of Rs. 1,000 per month to provide growth monitoring, food

Figure III.4 : Child underweight rate (%) in 1992-93 and percent annual decline in underweight rate, 1992-98, by state

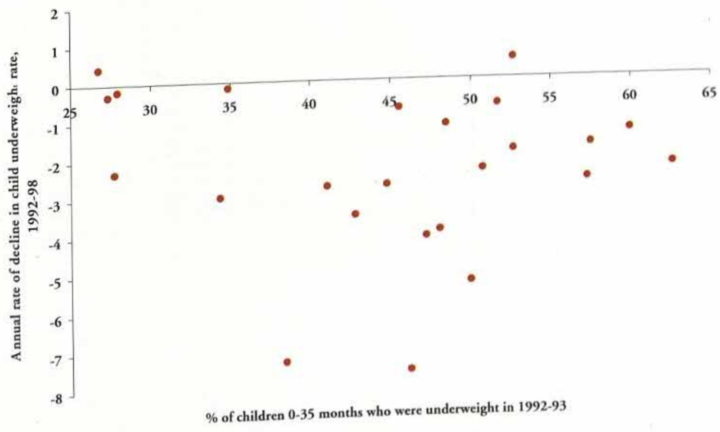
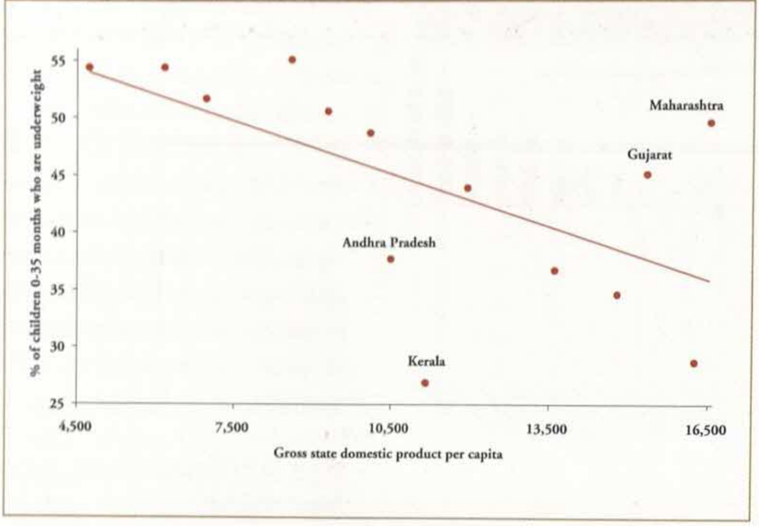


Figure III.5 : Child underweight rate (%) and gross state domestic product per capita across states, 1998-99

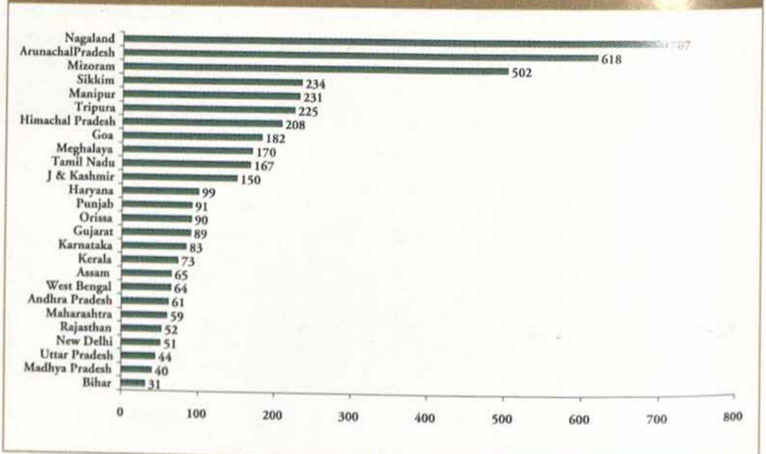


supplementation, and pre-school education to targeted children aged 0-6 years in the village. Although the program covers all the villages in the country, recent surveys from a few states suggest that relatively few (only about 10-30%) children aged 0-6 years in states such as Uttar Pradesh, Madhya Pradesh, and Rajasthan regularly attend the AWC in their community (Heywood 2003). This may be because the amount of food supplementation provided to children is meager or irregular or both. While the Central government pays for the salaries of the *anganwadi* worker and assistant, the individual states are responsible for lifting the food grains from the stocks of the Food Corporation of India and paying for the cost of transporting and distributing these food grains to the AWCs. This is the component of the ICDS that is typically under-funded (World Bank 1998, 2001).

Figure III.6 shows the total amount (excluding training) spent by various states in the country on the ICDS program. The amounts are expressed in terms of spending per child aged 0-6 years, since that is the target group of the ICDS.[50] Two observations can be made from this figure; first, the amounts spent by most states are low — typically below Rs. 200 per child per annum. Second, there are large inter-state disparities in spending on nutrition. The poor high-malnutrition states, such as Bihar, Uttar Pradesh, Madhya Pradesh, and Rajasthan, spend only Rs. 30-50 per child, while Gujarat, Punjab, and Haryana spend Rs. 90-100. Tamil Nadu's expenditure is about Rs. 170, while spending in the Northeastern states is above Rs. 500.

Is there an association between child underweight rates and

Figure III.6 : Government expenditure on ICDS (child nutrition program (excluding training) per child aged 0-6 years, 1999-2000 (nominal Rs.)



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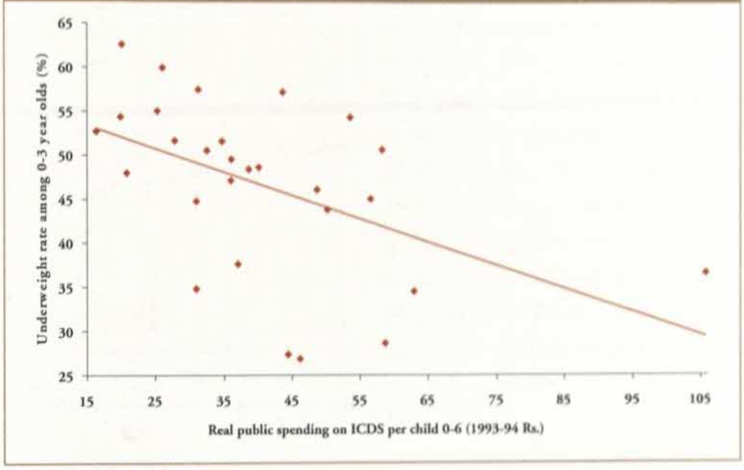
[50] Even though the target group is 0-6 years, the ICDS has historically focused on children aged 3-6 years. The focus on 3-6 year olds is a major design flaw of the ICDS, since malnutrition typically sets in much earlier in childhood. Experience from other countries, as well as from other nutritional interventions in India (e.g., Tamil Nadu Integrated Nutrition Project, discussed in Box III.1), has shown that child malnutrition can be addressed much better by targeting nutritional supplementation to children in the younger age groups.

per-child spending on the ICDS? Pooled data on 14 states for two years — 1992-93 and 1998-99 — suggest an inverse association (Figure III.7). However, since there is no control for other variables, such as per capita income, the association does not necessarily indicate a positive effect of public spending on nutrition. Indeed, there does not appear to be any association between changes in the level of per-child spending on ICDS and changes in the child underweight rate (Figure III.8).

Figure III.7 : Underweight rate among 0-3 year olds (%) and real expenditure on the ICDS program per child 0-6 years, across states, 1992-93 & 1998-99

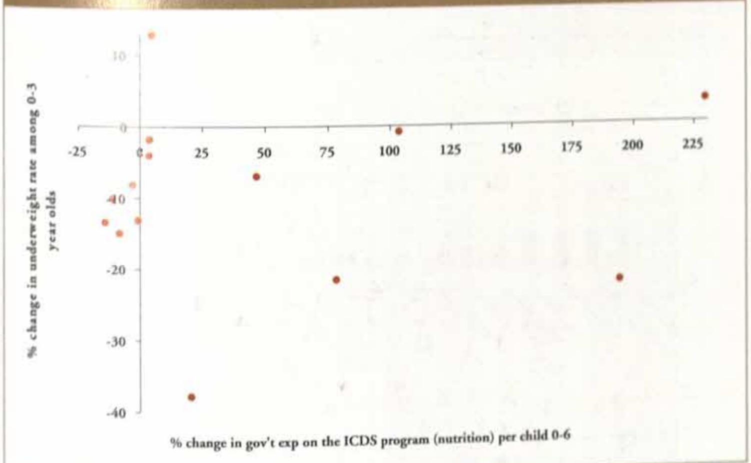


However, the data do suggest an inverse association between changes in the child underweight rate and changes in gross state domestic product per capita (Figure III.9). States that experienced greater growth in real gross state domestic product per capita between 1992-93 and 1998-99 experienced larger declines in the child underweight rate during the same period.

Intra-state Variations

Annex Table 8 presents data on the child underweight rate in 1998-99 for different regions in the country.[51] The child underweight rate ranges from a low of 11% in the Hills region of Assam to a high of 60% in Chhattisgarh. More than a third of the regions have child underweight rates of 50% or greater, confirming the ubiquity of child malnutrition in the country.

Figure III.8 : Changes in child (0-3) underweight rates (%) and in real government expenditure on the ICDS program per child 0-6 across states, 1992-93 to 1998-99



What is even more worrying is that more than a quarter of the regions in the country for which underweight data are available experienced an increase in child underweight rates between 1992-93 and 1998-99 (Annex Table 8). These regions are scattered around the country — in the poor states (Jharkhand, Bihar, Orissa, and Uttar Pradesh) but also in the more prosperous states, such as Gujarat, Maharashtra, and Haryana.

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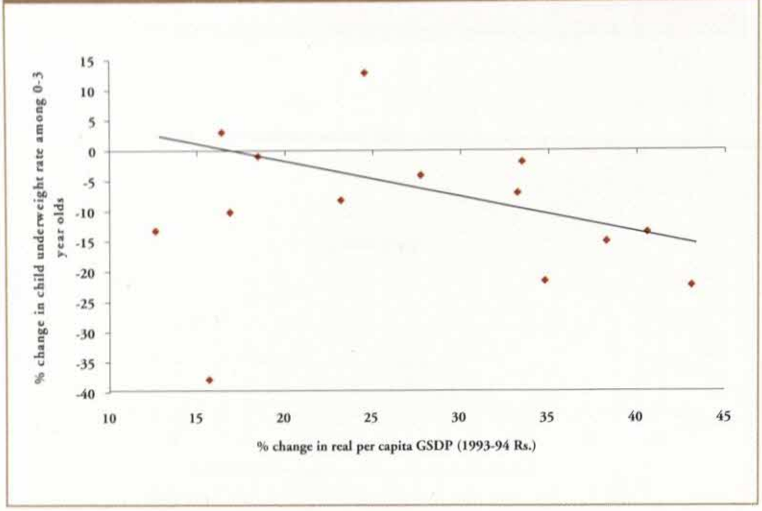
[51] It is not possible to obtain reliable district-level estimates of child malnutrition in India. Regional-level estimates are more reliable, given the sample size of the NFHS-2 survey. Data from the NFHS-2 are not available for a few of the regions.

Figure III.9 : Changes in child underweight rates and in real per capita gross state domestic product across states, 1992-93 to 1998-99



Concentration of Child Malnutrition

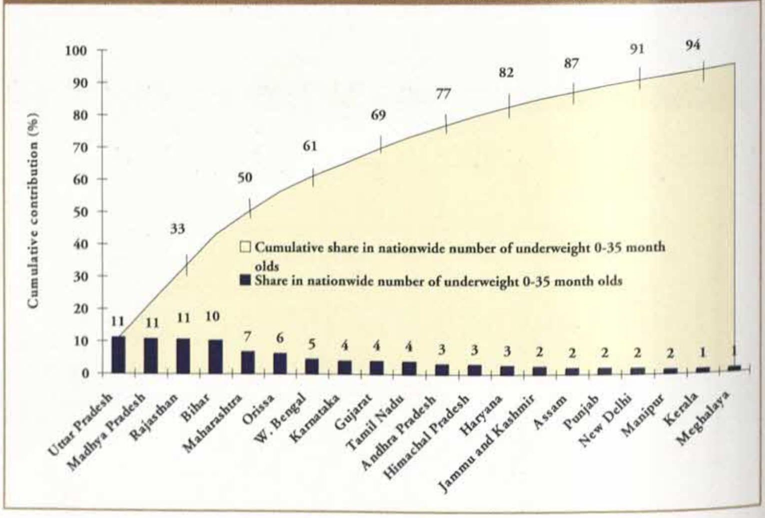
Child malnutrition in India is not as heavily concentrated geographically as, say, infant deaths. For instance, the four states — Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan — account for 51% of all infant deaths in the country, but for 43% of all underweight children under the age of 3 (Figure III.10). Nevertheless, in absolute terms, these are large numbers.

Disaggregating further, one finds that child malnutrition is relatively concentrated across districts and villages in the country. A mere 10% of districts and villages account for 27-28% — and a quarter of districts and villages account for more than half — of all the underweight children in the country (Figure III.11).[52]

Proximate Causes of Child Malnutrition

Infant Feeding Practices. An important correlate of child nutritional status is nutrient intake, which in turn depends on the nature and duration of feeding (including breast-feeding) practices. Feeding practices are especially critical during the first few days and months of an infant's life, since growth is faster and protection against illnesses and infections is most needed during this crucial period. Ideally, a baby should be put to the mother's breast immediately after birth. However, NFHS-2 data indicate that nearly one-half of Indian babies have to wait to be breastfed for more than a day after they are born (Figure III.12). In the poor states of Bihar, Uttar Pradesh, Madhya Pradesh, Orissa, and Rajasthan, this ratio is even higher (62%). This is how the cycle of child malnutrition begins very early in an Indian child's life. The

Figure III.10 : Contribution of 20 states to the national number of underweight 0-35 month olds, 1998-99



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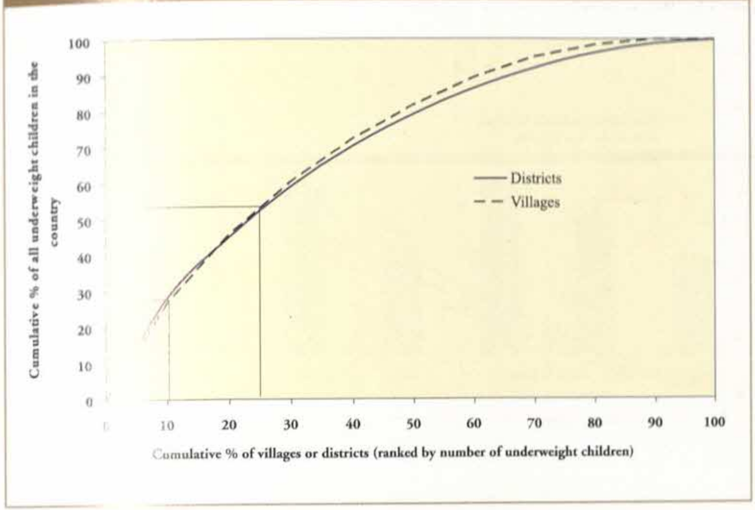
[52] As noted in chapter 2, the NFHS-2 covered only a fraction of all the villages in the country and the number of sampled households in each village is too small to be representative, these numbers are merely indicative of possible patterns. It would be worthwhile to explore the use of promising new methodologies available to more accurately identify villages with the largest number of underweight children in the country, so that nutritional interventions could be better targeted to these villages.

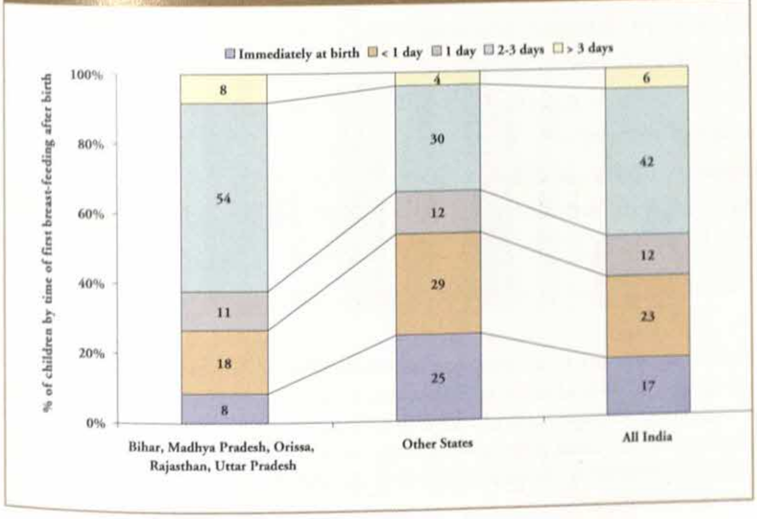
Figure III.11 : Cumulative distribution of all underweight 0-35 month old children in India across villages and districts, 1998-99



delay in breastfeeding is often related to an incorrect perception that the first breast milk (colostrum) is an inferior food, when in fact colostrum is rich in antibodies and highly beneficial to the new-born infant.

Another common feeding practice in India that has adverse implications for child malnutrition is the early termination of exclusive breast-feeding and introduction of supplementary feeding. One reason why mothers give up exclusive breast-feeding early is their perception that they are producing insufficient quantities of milk due to their poor nutrition and heavy workload. Premature introduction of foods other than breast milk greatly increases the risk of infection in the small infant, and this sets in motion the process of malnutrition. It also puts the infant at greater risk of malnutrition, since weaning diets are often inadequate in India. Supplementary feeding begins with a thin gruel of rice, often heavily diluted with water and with some vegetables or legumes added as a relish depending on season and availability, but generally in very small quantities. The consequent low energy density of this weaning food leads to a reduced intake of calories and protein, and is an important cause of growth faltering during the weaning period, from six months to two years of age. The NFHS-2 data indicate that nearly 49% of children aged 0-4 months and 58% of children aged 0-6 months are not exclusively breastfed (i.e., supplementary feeding is introduced), which is not in line with the recommendations of WHO and UNICEF that exclusive breastfeeding continue for the first six months of a child's life.

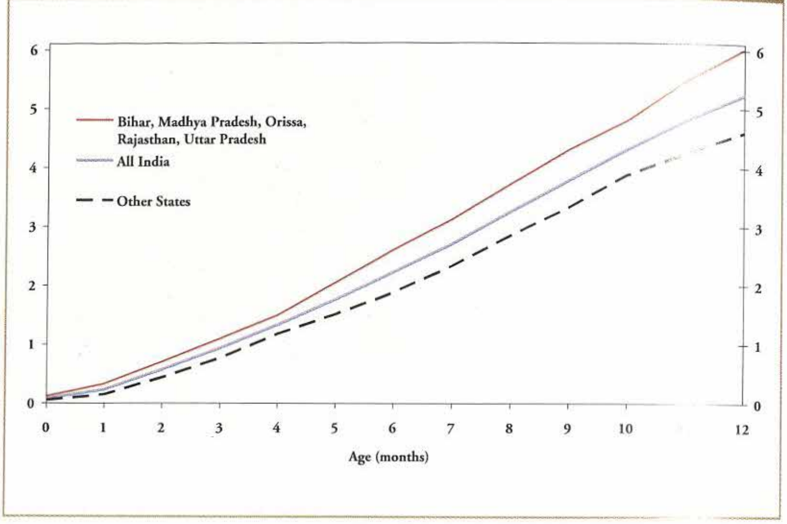
Figure III.12 : Initiation of breast-feeding after birth, by groups of states, 1998-99



Infections

Illness and infection, especially diarrheal infections, are strongly associated with child malnutrition. Infections reduce the ability of the body to absorb critical nutrients from food, which in turn leads to malnutrition.[53] The NFHS-2 data indicate that an average infant begins suffering from diarrheal diseases very early in his or her life; by the age of 6 months, he or she has already experienced an average of 2.2 diarrheal episodes, and by the age of 12 months, 5.2 illness episodes (Figure III.13). Diarrhea is even more prevalent among infants in the poor states of Bihar, Madhya Pradesh, Uttar Pradesh, Orissa, and Rajasthan. The NFHS-2 data also show that children who have suffered a diarrheal episode are 15% more likely to be underweight than children who have not experienced diarrhea.[54]

Figure III.13 : Cumulative number of diarrheal infections experienced by infants, by age (months), 1998-99



Maternal Weight and Low Birth Weight

For a large number of Indian children, malnutrition begins very early in life — when they are born with low birth weight. As Figure III.14 shows, children born with a weight of less than 2.5 kgs are at significantly greater risk of subsequent malnutrition than children whose birth weight is above 2.5 kgs. Nationally, about 22% of births classify as low birth weights, with wide variations across states. In Uttar Pradesh and Madhya Pradesh, more than a third of all children weigh less than 2.5 kgs at birth. Even in Kerala, the proportion of low birth weights is as high as 18%.

Low birth weight in turn is determined by a number of factors, but important among them is maternal nutrition. Malnourished or low-weight mothers are more likely to give birth to low-weight babies, which implies that children of low-weight mothers are more likely to be malnourished than children of heavier mothers. Figure III.14 shows this trend; nearly three-quarters of children under 3 born to mothers whose weight is less than 35 kgs. are likely to be underweight. This ratio drops to just over a quarter for mothers weighing 50 kgs or more.

Socio-economic Correlates of Child Malnutrition

Living Standards

There is remarkably little variation in child underweight rates across economic groups. Indeed, the prevalence of child malnutrition is virtually identical across the bottom four consumption quintiles, with only the top quintile (representing the richest 20% of individuals) showing significantly lower child underweight rates

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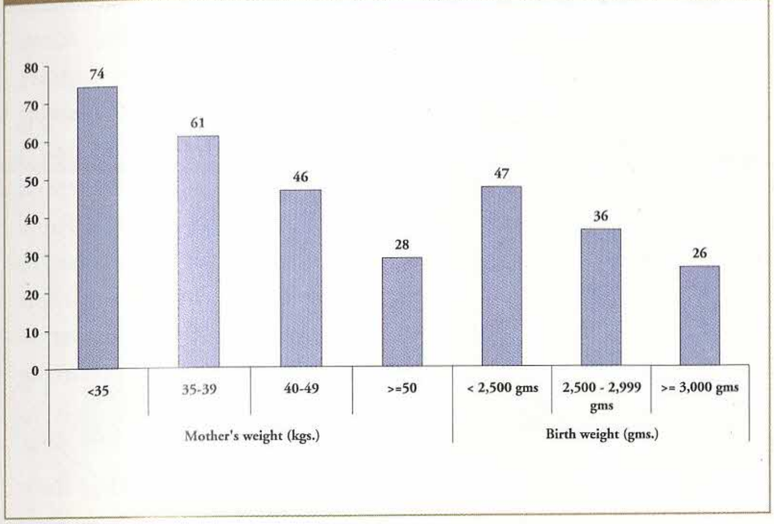
[53] The association reflects two-way causality; while infections lead to malnutrition, malnourished children are more susceptible to infections.

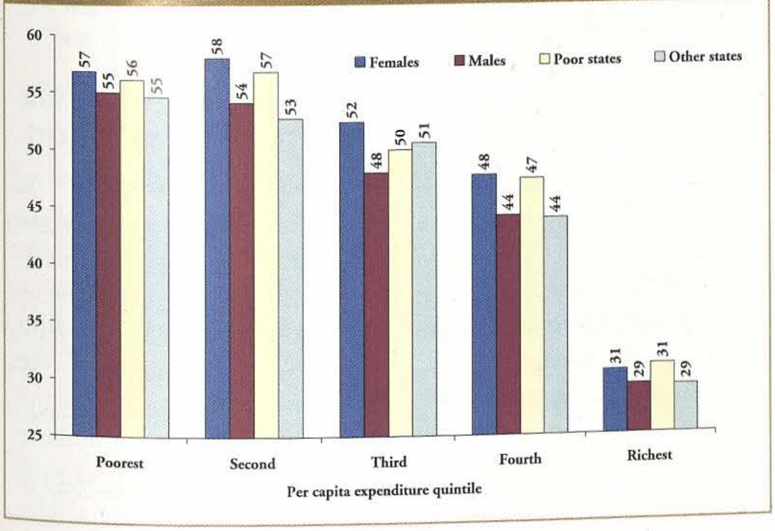
[54] It is not just diarrhea that reduces nutrient absorption of the body; even repeated bouts of fever (indicating infection) and acute respiratory infections can slow down weight gain and lead to malnutrition. It is unlikely however that a single bout of diarrhea, fever or cough could lead to severe malnutrition. What is more likely is that the children who report being ill during the two-week reference period are the ones who repeatedly come down with diarrhea, fever or cough. It is this chronic fever and cough that is associated with a higher risk of malnutrition. Indeed, malnutrition also increases a child's susceptibility to infections, and so the 'causality' can go in the reverse direction.

Figure III.14 : Percent of children under 3 who are underweight, by mother's weight and birth weight of child, 1998-99



(Figure III.15).[55] The fact that nearly a third of the top consumption quintile in the country — a group that is likely to have good economic access to food — is malnourished suggests that cultural and social factors have an important role to play in determining child malnutrition in India. This is also consistent with the evidence, cited earlier, that the child underweight rate is relatively high in prosperous states like Gujarat and Maharashtra.

Figure III.15 : Child underweight rates (%) by per capita expenditure quintile, 1998-99



Social Groups

The NFHS-2 data also indicate somewhat higher child underweight rates for Scheduled Castes and Tribes and Other Backward Castes relative to the forward castes (Figure III.16). Scheduled Castes and Other Backward Castes appear to be at a greater disadvantage relative to the forward castes in the poor states than in the non-poor states.

Maternal Schooling.

There is a large literature from around the world that documents the many benefits of maternal schooling for child outcomes — infant and child mortality, child nutrition, and child schooling. The NFHS-2 data show a sharp decline in the incidence of child malnutrition with mother's schooling (Figure III.17). Children of mothers with no schooling are nearly two times more likely to be underweight than children of mothers with more than 8 years of schooling. Children of mothers with 6-8 years of schooling are more than two times more likely to be underweight than children of mothers with more than 12 years of schooling. Interestingly, unlike the case of infant mortality, the gender disparity in child underweight rates does not seem to narrow with mother's schooling.

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[55] Consumption quintiles are based on predicted household consumption expenditure per capita, the estimation of which is described in footnote 24 in chapter 2.

Figure III.16 : Child underweight rates (%) of various social groups in poor and other states, 1998-99

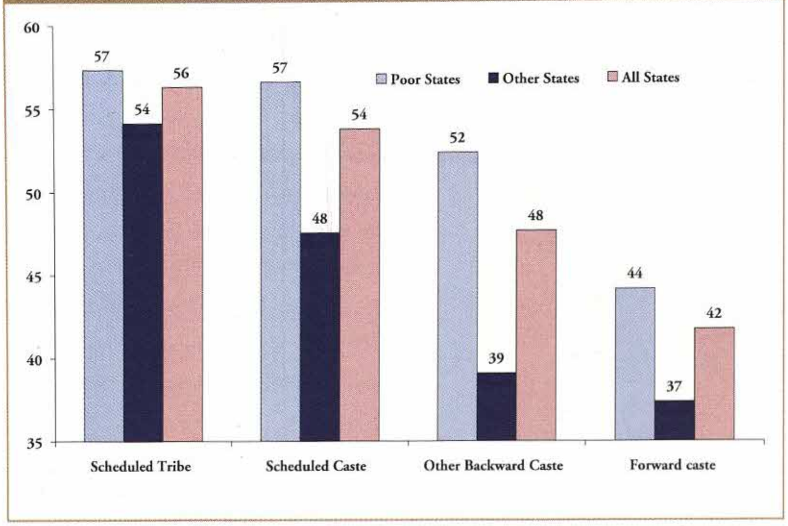
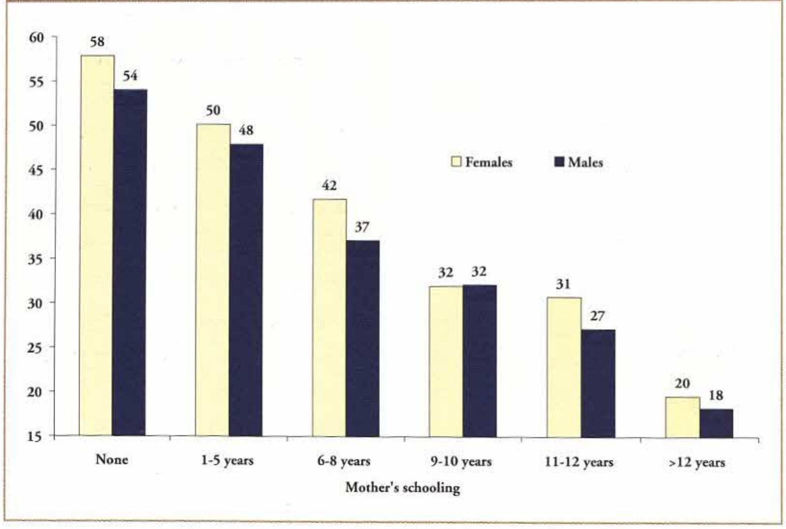


Figure III.17 : Child (0-3 years) underweight rates (%) by sex and by mother's schooling, 1998-99



Birth Order

As with infant mortality, the birth order of a child has a significant association with the probability of him or her being underweight. The disparity across birth order is greater for girls than for boys. For instance, while the underweight rate is 42% for first-born girls under 3, it is as high as 58% for birth order four or higher girls (Figure III.18).

Infrastructure

Given that repeated bouts of infection, especially gastro-intestinal and diarrheal, are an important reason for child malnutrition in India, access to safe drinking water and sanitation can improve child nutrition by reducing a child's exposure to water- and vector-borne diseases. Likewise, access to electricity can also improve nutritional status by improving the hygiene, cooking and health practices in the household and in the community. Rural roads enable easier access to markets and health workers and thereby better information to child nutrition-improving information.

The NFHS-2 data show significant associations between child underweight rates and the infrastructural variables (Figure III.19). The child underweight rate is about a third lower in villages having regular electricity supply than in villages with no electricity. Likewise, access to piped water and some toilet facilities is associated with significantly lower child underweight rates, although piped water access appears to be less important to child malnutrition in the non-poor states.

Multivariate Analysis of Child Malnutrition

To examine the likelihood of the various states in India attaining the child underweight MD goal, we have estimated a multivariate model of child underweight rates, using the NFHS-2 unit record data (at the child level).[56] The multivariate model has the advantage of controlling for several variables

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[56] Since the dependent variable in the model is a dichotomous variable (i.e., whether or not a child is underweight), the model has been estimated by the maximum-likelihood probit method.

Figure III.18 : Child underweight rates (%), by birth order and sex, 1998-99

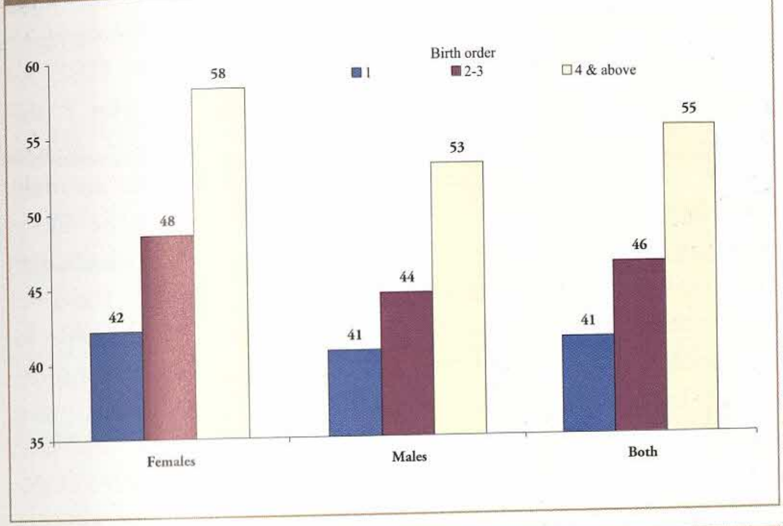
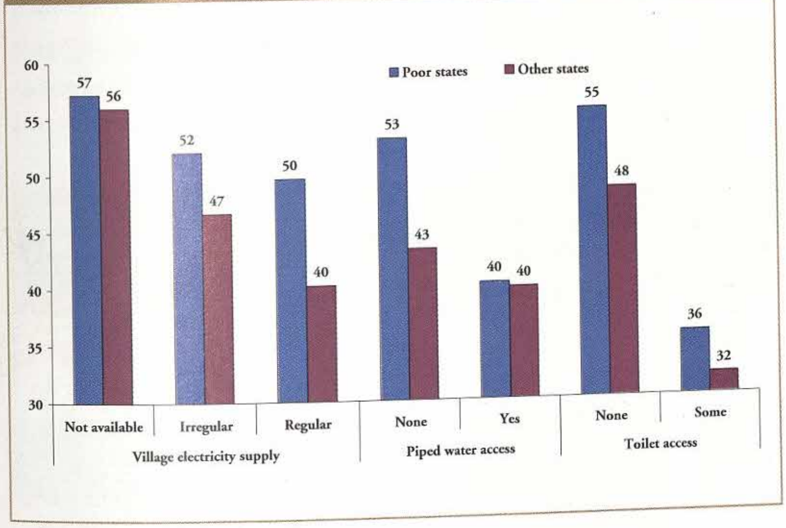


Figure III.19 : Child underweight rates (%), by infrastructure access, 1998-99



that may be simultaneously associated with child malnutrition. The estimation results are reported in Annex Table 2, while only the broad findings of the empirical analysis are discussed here.

The multivariate model confirms most of the bivariate relationships discussed earlier. Older children are observed to have a higher risk of malnutrition, but at a decreasing rate, such that the risk of malnutrition peaks at age 24 months. Mother's age reduces the probability of a child being underweight, but at a decreasing rate. Controlling for other factors, children belonging to Scheduled Castes, Scheduled Tribes and Other Backward Castes are significantly more likely to be underweight than children belonging to forward castes. As with infant mortality, girls per se are not at significantly greater risk of malnutrition than boys, but sex interacts with birth order such that higher birth order girls have a significantly greater risk of being underweight than higher order boys.

Infrastructure generally has strong associations with child malnutrition. Children in households having no access to a toilet are, on average, 8.6% more likely to be underweight than children in households having access to a toilet. Surprisingly, piped water access has no significant (independent) association with the probability of malnutrition, probably reflecting the fact that it is highly correlated with toilet access. As in the case infant mortality, access to electricity is strongly associated with child malnutrition, but the association is much weaker with irregular electricity supply. Finally, proximity to sealed (*pucca*) roads is also associated with a sharp reduction in child underweight rates.

Other variables that are significantly associated with child malnutrition are the mother's schooling, whether there was a medical professional at the time of the child's birth, log of predicted monthly consumption expenditure per capita (proxying for the household's income and living standard), and log of government expenditure on nutritional programs per child aged 0-6 years in the child's state of residence. The significant association between government nutritional expenditures per child and child malnutrition is supported by the finding, discussed in Section I below, that the risk of a child being underweight is inversely associated with the presence of an Integrated Child Development Services (ICDS) center in the child's village of residence. Much of the government nutritional expenditure in India is on the ICDS program. The empirical results further indicate that the (inverse) association between child malnutrition and levels of government nutritional expenditure is stronger in the poor states than in the non-poor states. However, neither public spending on health and family welfare per capita nor per capita GDP in the child's state of residence has a significant association with child underweight rates.[57]

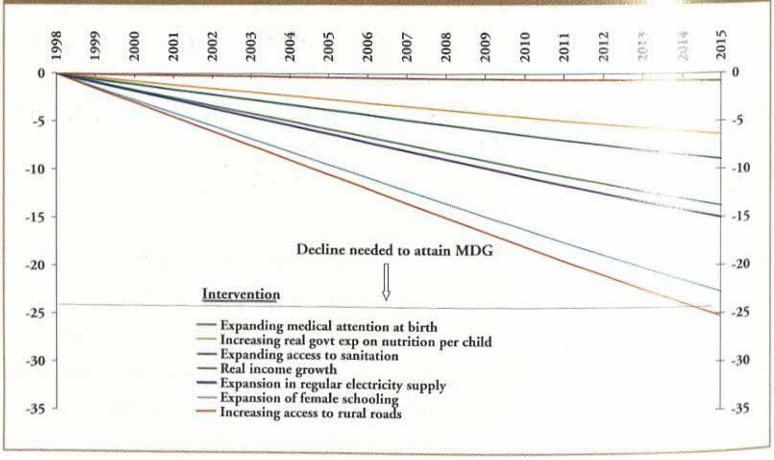
Simulations to 2015

Based on the multivariate probit model estimated earlier, we have undertaken simulations of the child underweight rate for the poor and the non-poor states under different intervention scenarios. These are shown in Table III.1. If the poor states were simply brought up to the national average in terms of coverage of sanitation, road access, electricity, medical attention at time of delivery, female schooling, household income (consumption) and public spending on nutrition per child, the cumulative reduction in the child underweight rate would be of the order of about 8 percentage points (or 15%). If the magnitude of the proposed interventions were scaled up so as to bring the poor states to the average level prevailing in the non-poor states, the cumulative reduction in the child underweight rate would be 21 percentage points or 38%.

Below, we use the probit results discussed above to simulate cumulative changes in the child underweight rate in the poor states from 2000 to 2015 based on certain intervention scenarios. The nature and magnitude of the interventions are detailed in Table III.2. As noted already in chapter 2, the scope and magnitude of the assumed interventions are only meant to illustrate the likely reduction in child malnutrition under one possible scenario. It is obviously not possible to predict whether the assumed interventions will indeed take place, and, even if they do, whether they will proceed as the pace assumed in Table III.2.

Figure III.20 shows the projected changes in the child underweight rate in the poor states when the seven interventions shown in Table III.2 are pursued

Figure III.20 : Projected decline in % of children 0-3 who are underweight in the poor states, 1998-2015, under different intervention scenarios
(graph shows cumulative effect of each additional intervention)



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[57] As an alternative, the probit equation was estimated with a set of 23 state dummy variables, which replaced all the state-level variables (e.g., log of gross state domestic product per capita, log of state government nutrition per child, interaction between the log of government nutrition expenditure per child and a dummy variable for the poor states, and log of health expenditure per capita). Although the full set of state dummy variables was significant at the 5% level, the explanatory power of the regression, as measured by a pseudo R-squared measure, actually declined from 0.172 to 0.170 with the substitution of the state fixed effects for the four state-level variables. This suggests that the state fixed-effects model is not a superior model to the one reported here in terms of goodness-of-fit.

Table III.1 : Projected decline in child underweight rates (percentage points) with various interventions in the poor and non-poor states

	Bringing the poor states to the level of:			
Type of Intervention	National average	Non-poor states' average	50% coverage	100% coverage
No access to toilet (%)	-0.5	-1.4	-2.0 (-0.6)	-5.7 (-4.3)
Access to regular electricity supply (%)	-0.4	-0.8	-1.6 (-0.8)	-5.3 (-4.5)
Access to irregular electricity supply (%)	-0.3	-1.1	-1.3 (-0.2)	-3.1 (-2.0)
Female schooling (years)	-1.3	-3.9	-5.8 (-1.8)[a]	-8.0 (-4.1)[b]
Monthly consumption expenditure per capita (Rs.)	-1.0	-2.9		
Government expenditure on nutrition per child aged 0-6 years (Rs.)	-2.9	-6.9		
Percent of villages in district connected to a *pucca* road (%)	-1.0	-2.9		-6.2 (-3.3)
Medical attention at time of child's delivery (%)	-0.3	-1.1	-0.5	-2.1 (-1.0)

Notes: Figures in parentheses refer to the underweight reduction obtained in the non-poor states.

[a] The assumed coverage level in this case is 6.5 years of schooling.

[b] The assumed coverage level in this case is 8 years of schooling.

Empty cells indicate no substantial reduction in infant mortality due to the specific intervention being considered.

Table III.2 : Assumptions about various interventions to reduce the child underweight rate in the poor states, 1998-99 to 2015

Intervention	Starting value in 1998-99	Assumed change per year	Ending value in 2015
Female schooling (years)	2.7	0.3	7.8
Per child government expenditure on nutrition programs (Rs.)	51	4%	98
Consumption expenditure per capita (Rs.)	422	3%	698
Population coverage of regular electricity supply (%)	27.7	1% point	44.7
Population coverage of professionally assisted deliveries (%)	32.3	1.5% points	57.8
Village access to *pucca* roads (%)	59.5	1% point	76.5
Population with no access to toilets (%)	76.5	-2% point	42.5

simultaneously. It is obvious that, while each of the interventions contributes to the reduction in child malnutrition, the ones that are associated with the largest declines in child malnutrition are increased per-child public spending on nutritional programs, increases in household consumption expenditure per capita, and expansion of adult female schooling. What is encouraging is that, together, the seven interventions are associated with a reduction of 25 percentage points in the child underweight rate in the poor states — enough for them to reach their MD goal of 27.3% of children being underweight. This suggests that while attaining the child nutrition MDG will be challenging in the poor states, it is clearly feasible with a package of interventions that include economic growth, increased public spending on nutritional programs, improved physical infrastructure (electricity, sanitation access, medical attendance at birth and rural roads), and expansions in female schooling.

The caveats noted in chapter 2 apply here as well. The fact that public spending on nutritional programs is associated with lower rates of child malnutrition does not mean that increasing government nutritional expenditure is sufficient. There is considerable evidence that nutritional programs in India, such as the ICDS, National Mid-Day Meal Program, and the various micronutrient programs, have poor coverage, targeting and implementation. The ICDS, for example, mostly focuses on children aged 3-6 years, but the consensus among nutritionists is that it is critical for direct nutritional interventions to reach 6-24 month olds and pregnant women to prevent malnutrition (World Bank 1998, 2001).[58] Further, the ICDS *anganwadi* center health worker — one per center — is typically over-burdened, as she has to manage pre-school education, supplementary feeding, and outreach activities. Another problem with the ICDS program is the frequent disruptions in food supplies that take place at the *anganwadi* center. The responsibility for the food component of the program lies with the state governments, which typically under-finance this component owing to cost and logistical difficulties. One evaluation of the ICDS found that disruptions in food distribution were very common at most *anganwadi* centers, with the average center going without any food rations for 64 days per year (out of an intended 300 feeding days) (National Institute of Public Cooperation and Child Development 1992).

But it is also the case that spending on direct nutritional programs is very low in India; it amounts to only 0.19 percent of GNP. In contrast, neighboring Sri Lanka spends about one percent of GNP on direct nutritional programs (World Bank 1998). A major World Bank report on malnutrition argues that, given the magnitude of the malnutrition crisis, India should be prepared to spend a minimum of 0.5 per cent of GNP on direct nutrition programs — more than double what it currently spends (World Bank 1998). It goes without saying that the scaling-up of direct nutritional interventions would have to go hand in hand with revamped design, greater devolution, and better implementation of such interventions. The highly-successful Tamil Nadu Integrated Nutrition Program (TINP), which has been in operation for more than twenty years (and preceded the ICDS) in the state of Tamil Nadu, offers important lessons for the design of direct nutritional interventions (see Box III.1).

ICDS and Child Malnutrition

Since the Integrated Child Development Scheme (ICDS) accounts for much of the public spending on nutrition in India, it may be instructive to analyze the impact of that scheme on child nutritional outcomes. Unfortunately, such an evaluation is stymied by the lack of availability of relevant data and by the fact that, by now, the scheme extends to virtually every

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[58] There is also some anecdotal evidence that the ICDS has done better (in terms of addressing child malnutrition) in states such as Tamil Nadu and Rajasthan which have better targeted the program to younger age groups.

Box III.1: The Tamil Nadu Integrated Nutrition Project

The Tamil Nadu Integrated Nutrition Project, which was started in 1980 by the state government of Tamil Nadu, was one of the first projects in the world to make large-scale use of growth monitoring of children aged 6-36 months old as a means to target the neediest children and monitor their progress. TINP has been hailed as the most successful nutrition intervention program in India (and probably the world) (Berg 1987). It began as an area-targeted (to the rural areas of six districts having the lowest caloric consumption in the state but subsequently extended to the entire state), age-targeted (concentrating exclusively on children 6-36 months of age, who accounted for 90 per cent of the pre-school deaths in the state, and pregnant and lactating women), and need-targeted program. The latter was achieved by monitoring the weights of all children 6-36 months old in the project villages, and enrolling only those children whose weight gain over a certain period fell below standard in a 90-day supplementation program that included daily feeding and counseling of mothers. Since the children were on the supplementation program only for the duration of time their weight gain was below standard, the project was basically seen as a short-term intervention that sought to reduce long-term dependence of beneficiaries on public assistance. To this day, TINP relies heavily on local nutrition workers, working in conjunction with local women's and girls' groups. The groups are taught behavior-change strategies. They learn to promote birth weight recording, regular monthly weighing, and spot feeding, while participating in community assessment, analysis, and problem-solving.

TINP links the delivery of health and nutrition services. Children who do not respond to the nutrition supplementation are provided health services, which include check-ups and referrals, treatment of diarrhea, deworming, and immunization. These services are also available to pregnant and lactating women. In addition, the program includes intensive counseling of mothers in nutrition and hygiene education.

Evaluation studies of the TINP have indicated significant effects of the program. Severe malnutrition fell significantly by 44 percent between 1992 to 1997, although moderate malnutrition was still quite widespread. Beneficiary children were able to maintain their weight advantage for two years or longer after they completed the program, indicating long-term effects. Costs per beneficiary were lower than for less targeted nutrition programs. Indeed, one study estimated that the annual recurrent costs of the TINP were less than one-half of the ICDS program operating in Tamil Nadu, while it had an impact on severe malnutrition that was two times as much as the ICDS. The cost difference between the TINP and the ICDS arises almost entirely from the fact that the ICDS is a mass feeding program, while the TINP is highly-selective supplementary feeding program.

Sources: Dapice (1987), Berg (1987), Chatterjee (1996).

village in the country. As such, there are no 'control' villages that offer a counterfactual — viz., the prevalence of child malnutrition in the absence of the program.

However, at the time the NFHS-1 data were collected in 1992-93, ICDS did not fully cover all the villages in the country. Fortunately, the NFHS-1 village/community questionnaire obtained information on whether a sampled village had an ICDS *anganwadi* center (AWC).[59] By merging the household information on child anthropometry and the village information on the existence of an AWC, it is possible to examine how the location of an AWC in a village is associated with child malnutrition levels in that village.

The NFHS-1 data indicate that 34.5% of villages in the NFHS sample had an AWC. Overall, the data show the child underweight rate (for children under 4) to be somewhat lower in the villages having an AWC than in village not having one (51% versus 55%).[60] However, upon disaggregating the numbers by sex, it is found that the presence of an ICDS *angawadi* center is associated with a much larger reduction in malnutrition for boys than for girls (Figure III.21).

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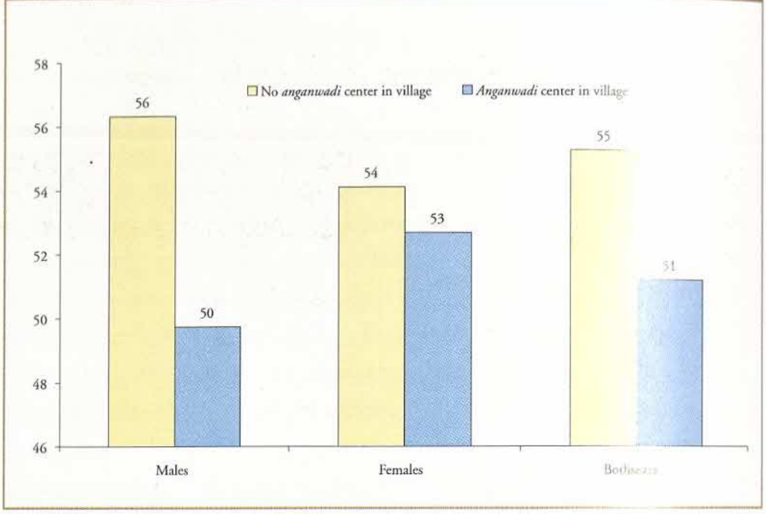
[59] This information was not collected in the NFHS-2 data, presumably because ICDS coverage (of villages) was near universal by the time of that survey.

Figure III.21 : Percent of children under 4 years who are underweight, by sex and presence of ICDS *anganwadi* center in village, 1992-93



Since it is important to control for other variables, such as household living standards and maternal schooling, in comparing the child underweight rate across AWC and non-AWC villages, we have estimated a multivariate probit model of child malnutrition with the NFHS-1 data, exactly along the lines of the model estimated with the 1998-99 NFHS-2 data (and shown in Annex Table 2) but with the addition of an explanatory variable indicating the presence of an ICDS *anganwadi* center in a child's village of residence. The empirical results, shown in Annex Table 3, confirm the pattern observed in Figure III.21; the presence of an ICDS anganwadi center in a village is associated with a reduction of about 5% in the child underweight rate, but this association is observed only for boys. There is no significant association of an ICDS *anganwadi* center with the prevalence of malnutrition among girls aged 0-3. This surprising finding could reflect that parents tend to selectively bring their boys, but not their girls, for supplementary feeding at the center. Or it could indicate that *anganwadi* workers or helpers provide a larger allocation of food to boys than girls. This is an issue that merits further exploration.

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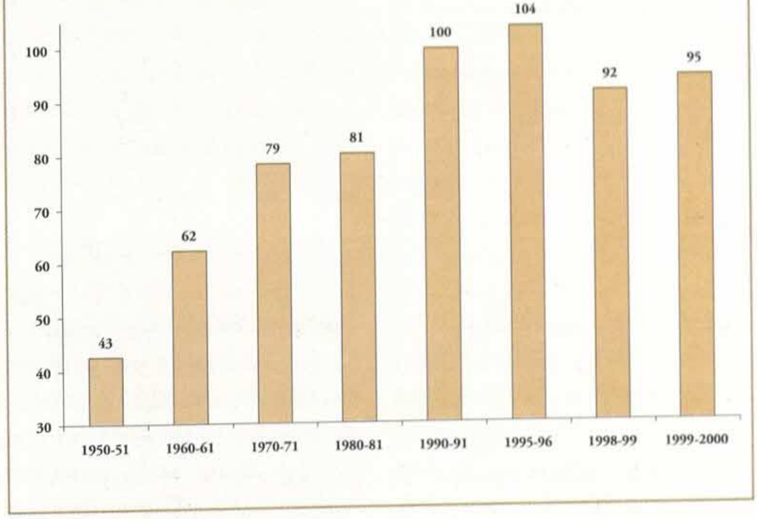
[60] Note that in the NFHS-1 (1992-93), anthropometric data were obtained for children under the age of 4 years, while the cut-off was 3 years in the case of the NFHS-2 (1998-99) data.

Primary Schooling

Universal primary enrollment is another one of the MDGs related to child welfare. The millennium development goal is to ensure that, by 2015, all children are in school, the net primary enrollment ratio is 100%, and that all the pupils entering grade 1 are retained until grade 5 (typically the last year of primary school).

The numerous benefits of schooling are well known and have been widely discussed in the literature on economic development. Schooling is one of the most powerful instruments for reducing poverty, unemployment and inequality; improving health and nutrition; and promoting sustained, human development-led growth. It is also self-perpetuating across generations, with educated parents much more likely to provide schooling to their children. Both the pecuniary and non-pecuniary returns from schooling have been well-documented in the literature for several countries, including India.

Figure IV.1 : Gross primary enrollment rates, India, 1950-51 to 1999-2000



Overall Trends

Levels and Trends

India has made rapid strides in schooling during the last 4-5 decades. The gross primary enrollment rate, which was only 43% in 1950-51, reached 100% by 1990-91, and has fallen slightly since then (Figure IV.1).[61]

As in many other countries, gross enrollment rates obtained from school administrative data in India tend to overstate the actual enrollment rate.[62] Household survey data show much smaller net, gross and age-specific enrollments. The most recent source of nationally-representative data on enrollments is the 55th round of the National Sample Survey (NSS) undertaken in 1999-2000. These data suggest that only 78% of children aged 6-11 years were attending school in 1999-2000. At 52.5%, the net primary enrollment rate was significantly lower.[63] There are many reasons for the discrepancy between household survey-based and school administrative records-based enrollment rates, including

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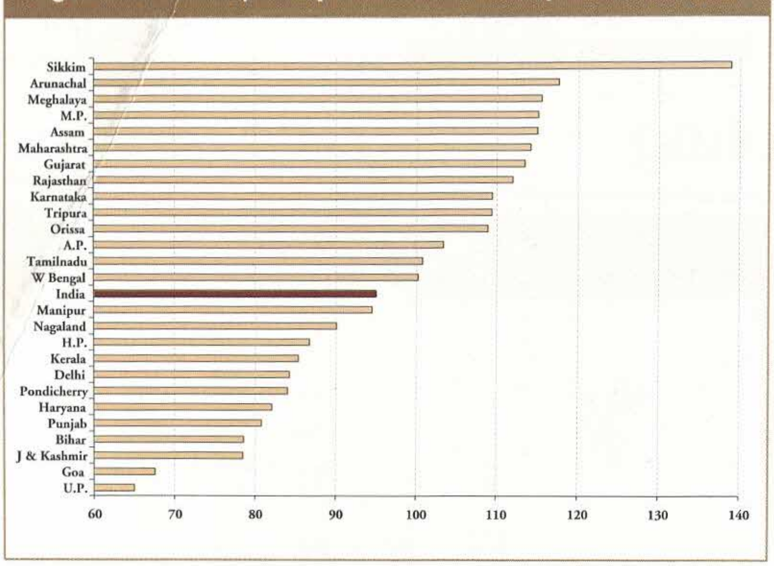
[61] Note that "primary" schooling refers to grades 1-5 in this chapter. The term "lower primary" is sometimes used in India to denote grades 1-5, while "upper primary" refers to grades 6-8. "Elementary" education refers to grades 1-8.

[62] Note that age-specific or net primary enrollment rates are not available from the school-based administrative data.

[63] The gross primary enrollment rate for 1999-2000 was 61%.

Figure IV.2 : Gross primary enrollment rates, by state, 1999-2000



the fact that household surveys typically obtain information on school *attendance* during a short reference period (the question to households typically is: "is your child currently attending school?"), while administrative data refer to students actually enrolled in the registers of the school at the beginning of the school year. In addition, gross enrollment rates from administrative records are very sensitive to incorrect estimates of the population of school-aged children. Finally, there are incentives for school administrators and district officials to overstate the number of enrolled students, since many types of government education expenditure allocations to schools and districts are often based on the number of enrolled students.[64]

Interstate Variations

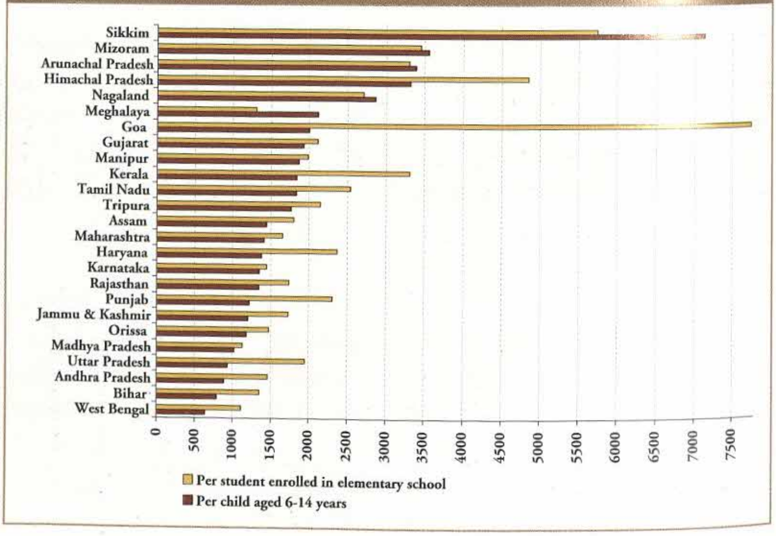
An average gross primary enrollment rate of 95% for the country in 1999-2000 for the country masks wide variations across states. Gross primary enrollment rates vary from a low of 65% in Uttar Pradesh to a high of 139% in Sikkim (Figure IV.2). Some of the numbers seem counter-intuitive, such as the relatively large rate for Rajasthan and the low rates for Kerala and Punjab, but these likely reflect differences in the extent of private-school enrollment across states. School-based enrollment data often do not include students attending private schools.

Economic Growth, Public Spending, and School Enrollments

Patterns of public expenditure on elementary education

As Figure IV.3 shows, states spend very different amounts on elementary education. In 1998-1999, Sikkim, Mizoram, Arunachal Pradesh, and Himachal

Figure IV.3 : Public spending on elementary education per child aged 6-14 years and per student enrolled in elementary school, 1998-99



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[64] Even so, the discrepancy between the gross primary enrollment rate of 95%, as reported by school administrative data, and 61%, as calculated from household surveys, is overly large. It is unlikely that it can be accounted for by students who are enrolled in school but not attending.

Pradesh spent upwards of Rs. 3,000 per child of elementary school age (i.e., 6-14 years). At the other end, Bihar, Uttar Pradesh, Andhra Pradesh, and West Bengal spent less than Rs. 1,000 per child 6-14. Thus, the states having low school enrollment or attendance rates are also the ones that spend less per child and per enrolled child. Note that some of the inter-state variation in the discrepancy between the amount of public expenditure per child and that per *enrolled* child arises due to variations in the proportion of children attending private schools. In Goa, Kerala, Punjab, and Haryana, for instance, private schooling is more common among children 6-14, with the result that public spending per child *enrolled in public school* is significantly larger than public spending per child aged 6-14.

Figure IV.4 shows the increase in public spending on education over time and across states. In most states, real growth in *aggregate* public spending on elementary education increased impressively between 1980-81 and 1999-2000 — exceeding the growth in the elementary school-aged population (ages 6-14) as well in elementary enrollments. As a result, real public spending *per child* 6-14 increased in virtually every state — at annual rates of 2% or more.

An important issue that arises is the allocation of public spending on education across levels. Since the unit cost of university education is much greater than that of elementary and secondary schooling, the share of universities and higher educational institutions in public spending on education typically exceeds their share of the total student population in most countries. This is true of India as well, but the mismatch between student and spending shares varies a great deal across states. An example of a state where the mismatch is large is Andhra Pradesh. The elementary education sector accounts for 63% of all students in the state but for only 50% of all public spending on education (Figure IV.5). In contrast, the higher schooling sector in Andhra Pradesh commands 20% of all public resources going into education but accounts for only 4% of the students. At the other extreme is Himachal Pradesh, where the shares of the elementary education sector in both the number of students and in total public spending on education are approximately similar.

It may be instructive to see how inter-state changes in public spending on elementary education per child are correlated with changes in enrollment rates over time. An advantage of the administrative data on enrollments is that they are available at the state level in India going back a number of years. In order to analyze the association between economic growth, public spending on elementary education, and gross primary enrollment rates across states and over time, we have merged the state-level data on gross primary enrollment rates over the period 1980-99 with state-level data on real gross state domestic product per capita (GSDP) and real

Figure IV.4: Annual % growth in elementary enrollments, population aged 6-14, and real government expenditure on elementary education per child aged 6-14, by state, 1980-99

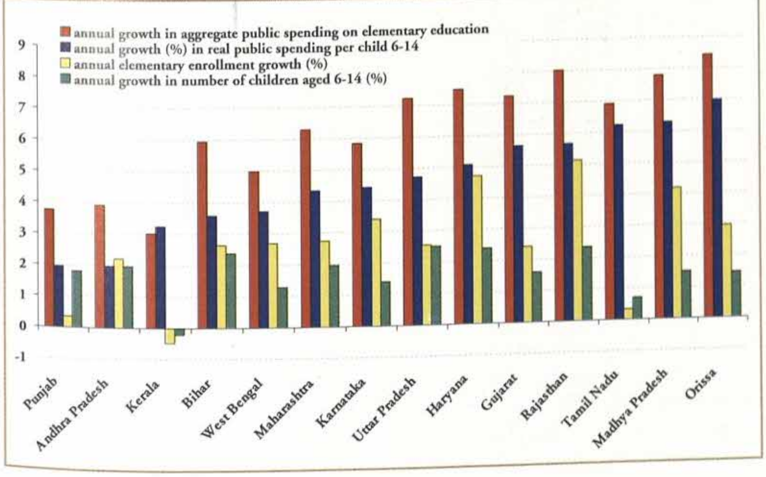
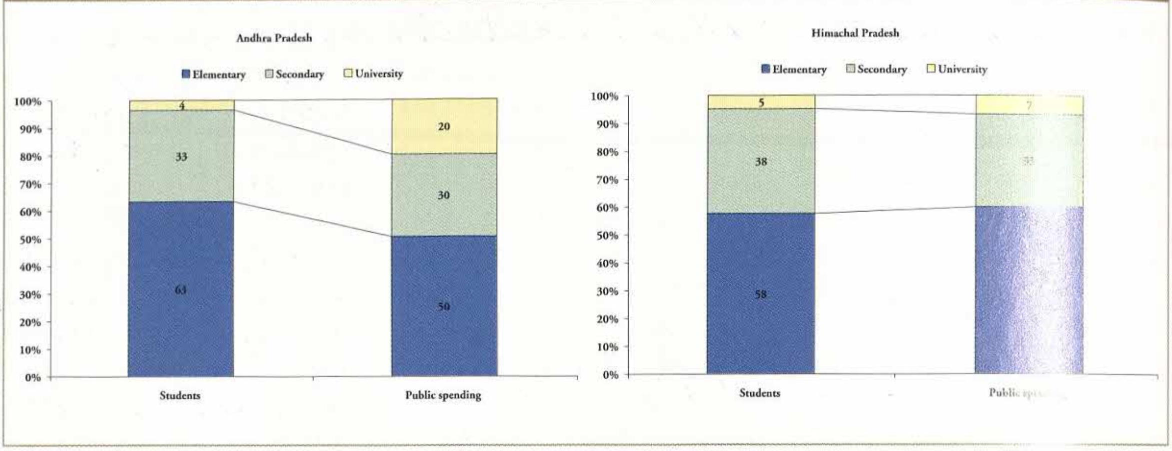


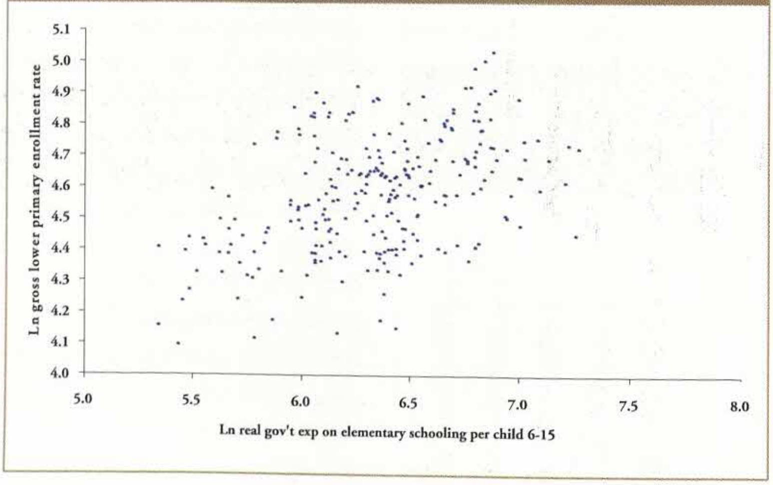
Figure IV.5 : Distribution of enrolled students and of public spending on education in two states, by level, 1998-99



public spending on elementary education per child over the same period.[65]

A plot of the data suggests a positive association between the gross primary enrollment rate and real government expenditure on elementary schooling per child aged 6-14 years (Figure IV.6). However, since there is no control for other variables that may also influence school enrollments, it is difficult to make much of the association observed in the figure.

Figure IV.6 : Gross lower primary enrollment rates and real public spending on elementary schooling per child 6-14, across states, 1980-99



Another manner in which to view the data is to examine the inter-state increases in elementary enrollments over the period 1980-81 to 1999-2000 relative to the growth of per child public spending on elementary schooling over the same period. This is shown in Figure IV.7. The figure suggests that over this 20-year period, some poor, low-enrollment states, such as Madhya Pradesh and Rajasthan, were able to enroll large numbers of children in elementary school with relatively small increases in public spending on elementary education. But other poor states, such as Uttar Pradesh, Bihar, and Orissa, were able to increase elementary enrollments by only half as much for every additional (public) Rupee devoted to elementary

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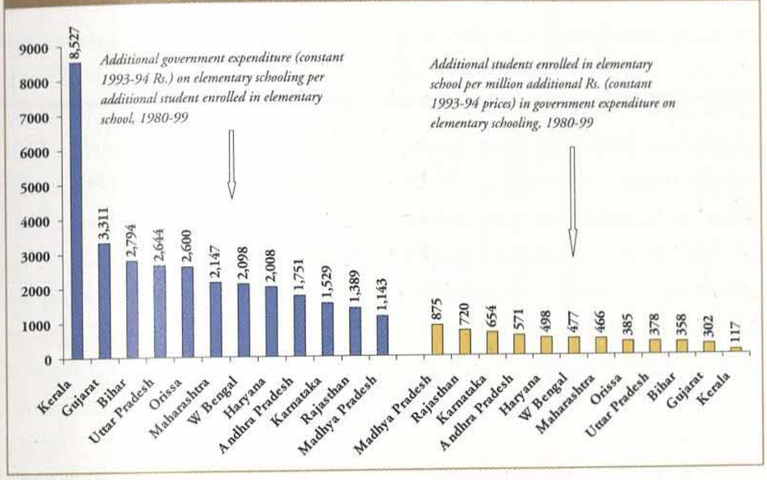
[65] Data on government elementary education expenditure were obtained from detailed budget demand documents of individual states. Although government expenditure on *primary* education is of interest in this paper, state government expenditure in India are available only for the *elementary* level, comprising the lower primary (grades 1-5) and upper primary (grades 6-8) levels. Note that the state government expenditure data used in this paper includes expenditure incurred by a state government out of its own revenues as well as central government allocations to that state.

Figure IV.7 : Inter-state increases in elementary school (grades 1-8) enrollments and in real government expenditure on elementary education, 1980-99

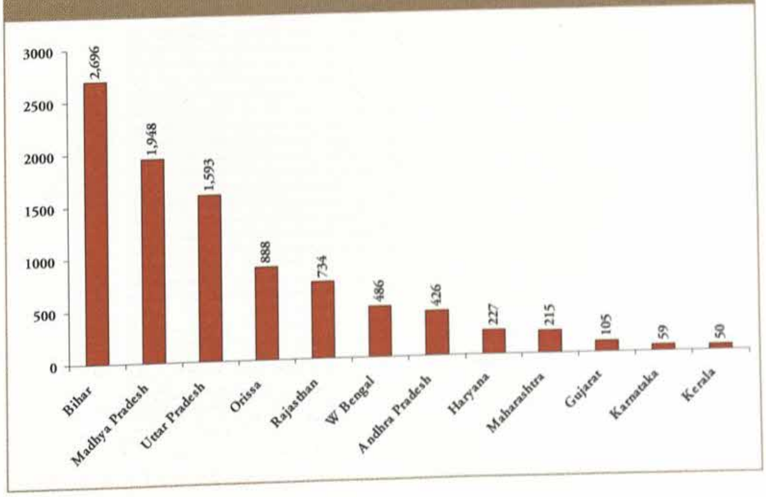


schooling. The differences observed in Figure IV.7 could, of course, reflect differences in the quality of schooling across states (as is most likely the case with Kerala, which had the lowest number of additional students in elementary school in relation to increased expenditures), but they could also reflect differences in the marginal cost of expanding enrollments. In Madhya Pradesh, the launch of the Education Guarantee Scheme (see Box IV.1), which expanded the number of schools in the rural areas of the state at relatively low cost, may have been responsible for the large increase in enrollments relative to changes in government elementary education expenditure per child.

Figure IV.8 shows the additional numbers of students enrolled at the lower primary level between 1980 and 1999 in several states relative to the real increase in *gross state domestic product per capita* over the same period. The poor states of Bihar, Madhya Pradesh, Uttar Pradesh, Orissa, and Rajasthan rank among the states that were able to obtain the largest increases in primary enrollments for given increases in (real) gross state domestic product per capita. Of course, these data simply reflect the fact that these poor states have experienced very little economic growth, but nevertheless have been able to increase primary enrollments significantly during the last two decades.

In Annex IV.1, an attempt is made to estimate the relationship between gross primary enrollment rates and government expenditure on elementary schooling per child 6-14 more formally and with controls for other variables. While the results of the analysis are not unambiguously clear, there is evidence of a significant positive association between the gross primary enrollment rate and per-child government expenditure on elementary education across states, even after controlling for per capita income and adult female literacy. In addition, depending upon different specifications, the positive association between the gross primary

Figure IV.8 : Additional number of primary school (grades 1-5) students enrolled per (1993-94) Rupee increase in gross state domestic product per capita, 1980-99



enrollment rate and government elementary school expenditure is observed to be stronger for the very poor states than for the non-poor states.

The finding that the positive association between enrollments and government expenditure on education is stronger in the poor states finds some support from another study on India. Lanjouw and Ravallion (1999) find that the poor in India typically benefit more than proportionately at the margin when there is an overall expansion in primary school enrollments. This happens because poor students are almost always the last to be enrolled, and the better-off are typically already in school. As a result, government educational expenditures that expand schooling access are generally well-targeted to the poor.

The econometric results presented in Annex IV.1 also indicate a strong positive association between the gross primary enrollment rate and per capita GSDP, with the association becoming weaker at higher per capita income levels. Surprisingly, however, when there is control for per capita GSDP and per-child public spending on elementary education, adult female literacy is not significantly associated with the gross primary enrollment rate.

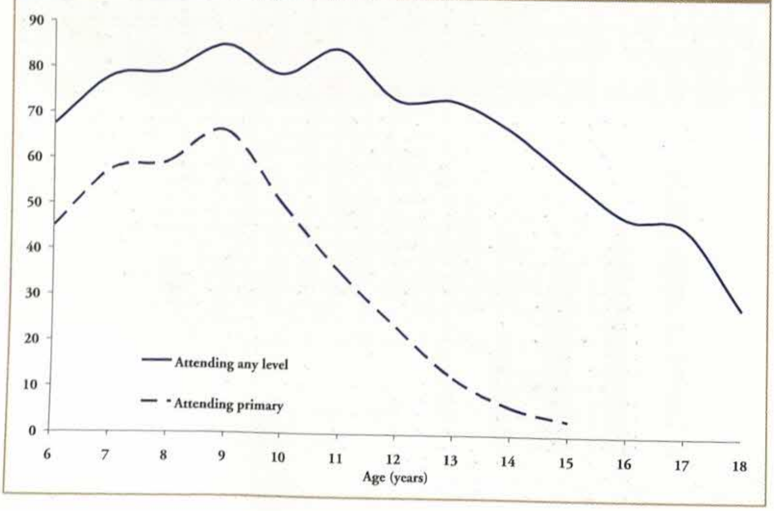
Household Survey-Based Enrollment Estimates

As noted earlier, gross enrollment rates obtained from school administrative records differ significantly from household survey-based estimates of enrollment (more appropriately, attendance).[66] Data from the latest NSS round (55th, undertaken in 1999-2000) suggest a gross primary enrollment rate of 61% and a net rate of only 52.5% in 1999-2000. Figure IV.9 shows the percent of children attending school and primary school by single-year age groups. This proportion rises from [illegible]% at age 6 to 84% at age 11, and then starts declining. The percentage of children who report attending *primary* school (grades 1-5) is 45% at age 6, increases to 66% at age 9, and then declines to 35% at age 11. The figure indicates that, even at the peak attendance ages of 9-11 years, nearly 15% of the population does not attend school. This is indicative of a large class of children who never attend school.

Trends

Despite the grim situation, there was some progress since the early 1990s. The 50th round of the NSS (undertaken in 1993-94) indicates that there was an increase of about 7-10% in the age-specific enrollment rate for ages 6-11 between 1993-94 and 1999-2000 (Figure IV.10). Additionally, the net primary attendance rate for 6-11 year olds also increased, albeit by not very much, over the same period. The decline in the net primary attendance rate observed for 13-15 year olds is a positive development insofar as it reflects a reduction in the rate of over-age enrollment in primary schools.

Figure IV.9 : School and primary school attendance rates, by age, 1999-2000



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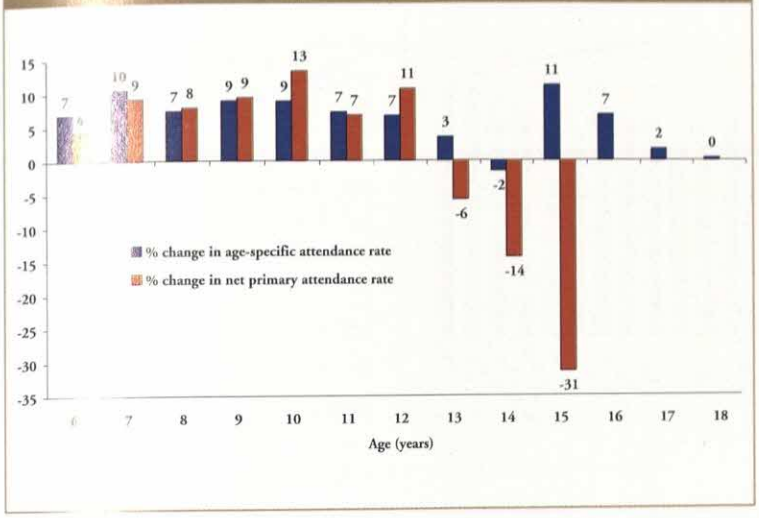
[66] In what follows, the terms 'attendance' and 'enrollment' are used interchangeably.

Figure IV.10 : Percent change in age-specific school attendance and net primary attendance rates, 1993-94 to 1999-2000



Inter-State Differences

There are large differences across states in the primary attendance rate (Figure IV.11). Attendance rates for the age group 6-11 exceed 90% in 9 states — Kerala, Tamil Nadu, Maharashtra, Goa, Himachal Pradesh, and the states of the Northeast. At the other end, the primary attendance rates are only 75% or lower in Bihar, Orissa, Rajasthan, Uttar Pradesh, and Madhya Pradesh. With only 53% of children aged 6-11 attending school, Bihar ranks as the poorest-performing state in the country.

Figure IV.11 also shows the very large disparity between the age-specific and the net primary attendance rate in all the states. Even in the states having high overall primary attendance rates, net primary attendance rates are significantly lower. For instance, Himachal Pradesh and Kerala, which have more than 95% of children aged 6-11 attending school, have a net primary attendance rate of only 68% and 61%, respectively. In Bihar, a mere 28% of children aged 6-11 attend primary school! The pervasively low net primary attendance rate (relative to the age-specific rate) is largely the result of late entry in primary school. For instance, the NSS 55th round data indicate that, in the country as a whole, 25% of 7-year old, 22% of 8-year old, and 15% of 9-year old school attendees were actually attending pre-primary (instead of primary) school in 1999-2000.

Figure IV.12 shows the changes across states in the age-specific enrollment rate for 6-11 year olds between 1993-94 and 1999-2000. In most of the poor states, such as Rajasthan, Madhya Pradesh, Uttar Pradesh, and Orissa, there was a large increase in the proportion of children aged 6-11 attending school. However, Bihar was an exception, with a small decline in the proportion attending school between 1993-94 and 1999-2000.

Intra-State Differences

Regional differences in the net primary school attendance

Figure IV.11 : Age-specific and net primary school attendance rates for 6-11 year olds, by state, 1999-2000

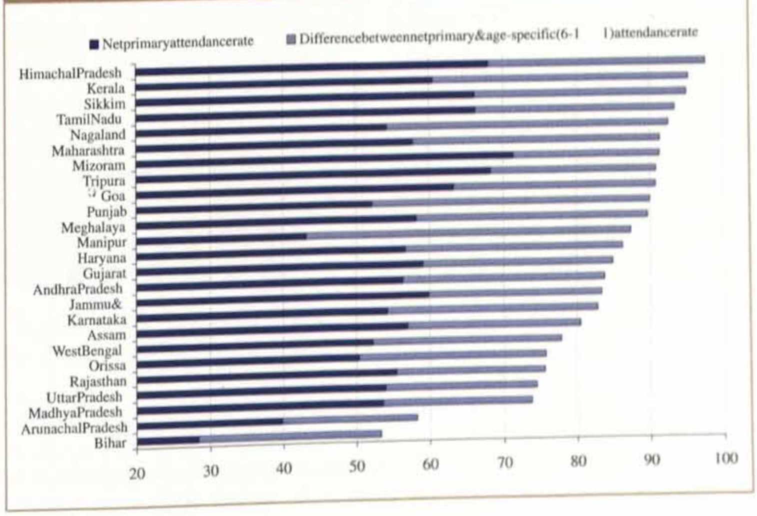
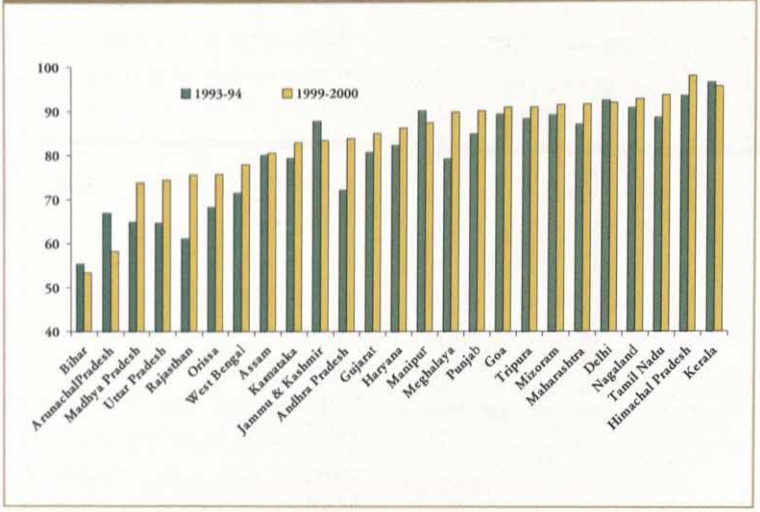


Figure IV.12 : Percentage of children aged 6-11 years attending school, by state, 1993-94 and 1999-2000



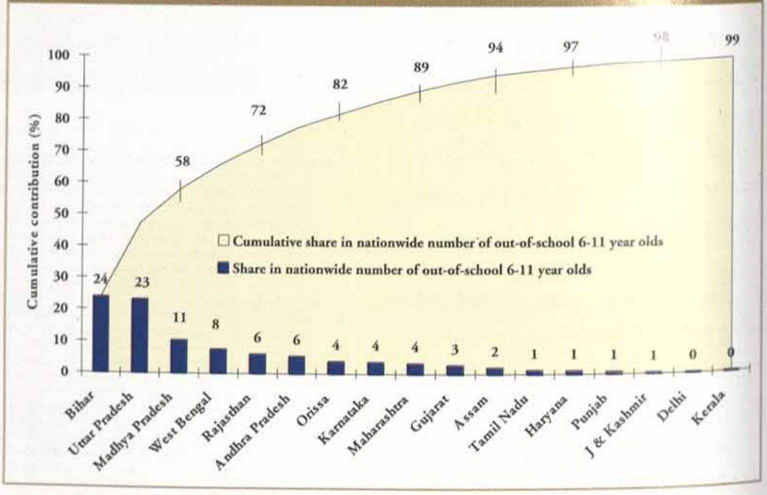
rate are shown in Annex Table 9.[67] Six regions in the country — largely in Bihar, Jharkhand, Orissa, and Manipur — had a net primary attendance rate of less than 40% in 1999-2000. Sixteen regions (about one-fifth of all the regions) had a net primary attendance rate of less than 50%. On the other hand, no region enjoyed a net rate of more than 76%. Even more discouraging is the fact that 29 regions (or more than a third of the regions in the country) either did not see an improvement in their net primary attendance rate between 1993-94 and 1999-2000, or saw it decline (Annex Table 9). Nine regions saw their net primary attendance rate increase by 40% or more during the same period.

Concentration of Out-of-School Children Aged 6-11

According to the NSS 55th round data, there were nearly 30 million out-of-school children aged 6-11 in India in 1999-2000. If the goal of policy is to reduce the absolute number of out-of-school children, it is important to analyze the distribution of these children across states and sub-national units. The NSS data indicate that nearly half of all out-of-school children in the country are found in the two states of Uttar Pradesh and Bihar (Figure IV.13). Madhya Pradesh accounts for another 11% of all out-of-school children aged 6-11. School non-attendance in India is thus more heavily concentrated geographically than infant deaths or the number of underweight children.

Disaggregating further, one finds that school non-attendance is extremely concentrated in relatively few villages in the country. A mere 10% of villages in the country account for nearly one-half of all out-of-school children aged 6-11, while 20% of villages account for three-

Figure IV.13 : Contribution of 17 states to the national number of 6-11 year olds out of school, 1999-2000



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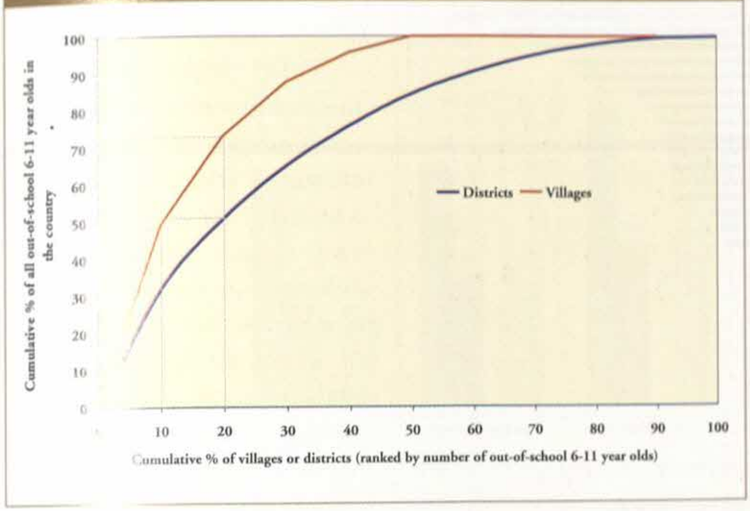
[67] As with other indicators, such as infant mortality and underweight rates, it is not possible to derive reliable estimates of enrollment rates at the district level. Hence, only regional estimates are provided here.

Figure IV.14 : Cumulative distribution of all out-of-school 6-11 year olds in India across villages and districts, 1999-2000



quarters of all out-of-school children (Figure IV.14). Most likely, these villages are Scheduled Tribe habitations that do not have a primary school of their own and are not within easy walking reach of a primary school. They are also likely to be poor villages where the opportunity cost of child labor (in terms of agricultural work) is high.

Primary Completion Rate

Getting out-of-school children into school is only one of the schooling-related millennium development goals. Another goal is retention of students — viz., to ensure that the entire cohort of children who begins grade 1 remains in school until grade 5. School retention is an indicator — albeit imperfect — of the quality of schooling. It is possible that in the rush to expand access to schooling, policy makers might compromise the quality of schooling. The compromise in quality would likely show up in lower rates of student retention and primary school completion.

Calculating the true primary retention rate or completion rate requires longitudinal data on children, but in the absence of such data, one can use household survey data on children's ever-schooled, currently-in-school, and current grade status. The NSS 55th round data do not report the specific grade which children attended at the time of the survey; however, the survey reports the current and completed schooling *level* of each child.

We use the above information to calculate the primary completion rate for children aged 12 years. Obviously, 12-year olds who never attended school are excluded from the calculation of the primary completion rate. A child is considered to have completed primary school if he/she reported being in middle school at the time of the survey and if he/she was *not* reported as never having attended school. Nationally, in 1999-2000, the primary completion rate, as calculated above, was 61.4% in 1999-2000 — only slightly up from 58.7% in 1993-94.[68, 69]

There are large variations in the primary completion rate across states (Figure IV.15). At 92.1%, Kerala has the highest primary completion rate, followed by Goa, Maharashtra, Karnataka, and Tamil Nadu. The Northeastern states and Bihar, Madhya Pradesh, Uttar Pradesh, and Rajasthan rank at the bottom, with primary completion rates of about 50% or lower. The intra-state

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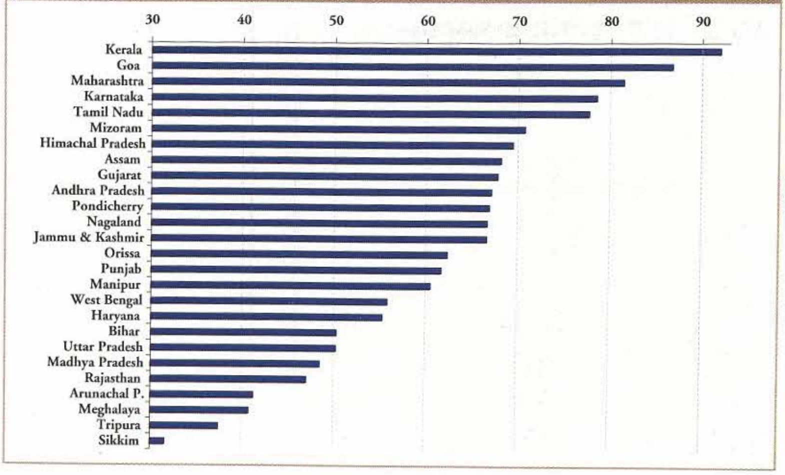
[68] Increasing the potential pool of children from age 12 to those aged 12-14 years does not make a large difference to the estimated primary completion rate. In 1999-2000, the estimated primary completion rate goes up from 61.4% to 65% when the age group 12-14 years is considered.

[69] Another, more widely-used method of calculating the primary completion rate is to compare the size of the first grade cohort in a given year with that of the sixth grade cohort five years later. Applying this method to administrative school data, reported in the various issues of *Selected Educational Statistics*, for 1994-95 and 1999-2000, one also obtains a primary completion rate of about 60%.

Figure IV.15 : Primary completion rate (%) by state, 1999-2000



differences in the *level* of the primary completion rate in 1993-94 and 1999-2000 are reported in Annex Table 9.

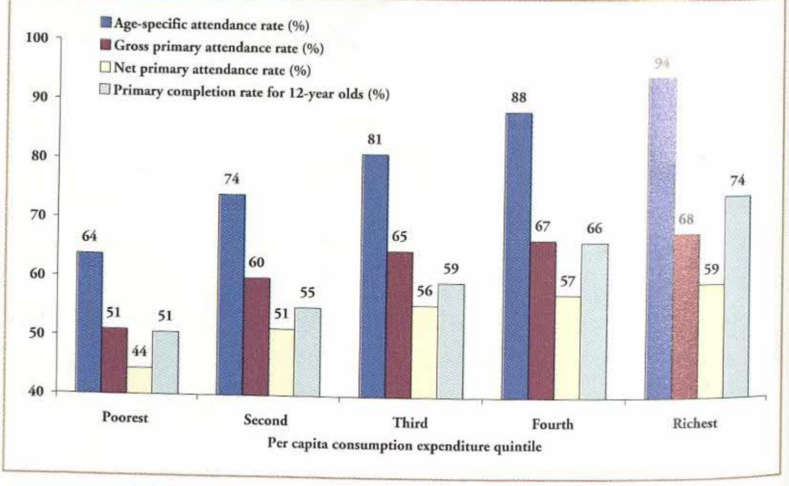
Socio-economic Differences in Primary School Attendance and Completion

As would be expected, there are large differences in the primary attendance and completion rates across consumption quintiles. In the top consumption quintile, nearly 94% of all children aged 6-11 attend school, while the corresponding proportion in the bottom quintile is only 64% (Figure IV.16). The fact that even the top consumption quintile has generally low net and gross primary attendance rates and low primary completion rates is rather surprising. It suggests that late entry into primary school and overage enrollment are endemic and not necessarily specific to low-income groups.

There are also large differences in primary school attendance and completion rates across social groups, with Scheduled Tribes having the lowest attendance and completion rates of all groups, followed by Scheduled Castes and Other Backward Castes (Figure IV.17).

There appears to be a threshold effect in the relationship between school attendance rates and adult female schooling (Figure IV.18).[70] The data suggest that the major difference in school attendance rates occurs between households in which the highest-educated adult female has no schooling at all and those in which the highest-educated female has some schooling. The number of years of schooling of the adult female, conditional on her having some schooling, does not appear to make much of a difference to the age-specific, gross or net primary attendance rates of children in her household.

Figure IV.16 : School attendance rates (ages 6-11) and primary completion rate for 12-year olds, by per capita cons. exp. quintile, 1999-2000



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[70] The NSS data do not permit identification of the mother of each child in the sample (unless the sample is restricted to biological children of the household head). We have therefore used the schooling years of the highest-educated adult female in a household as a proxy for maternal schooling.

Figure IV.17 : School attendance rates (ages 6-11) and primary completion rate for 12-year olds, by social group, 1999-2000

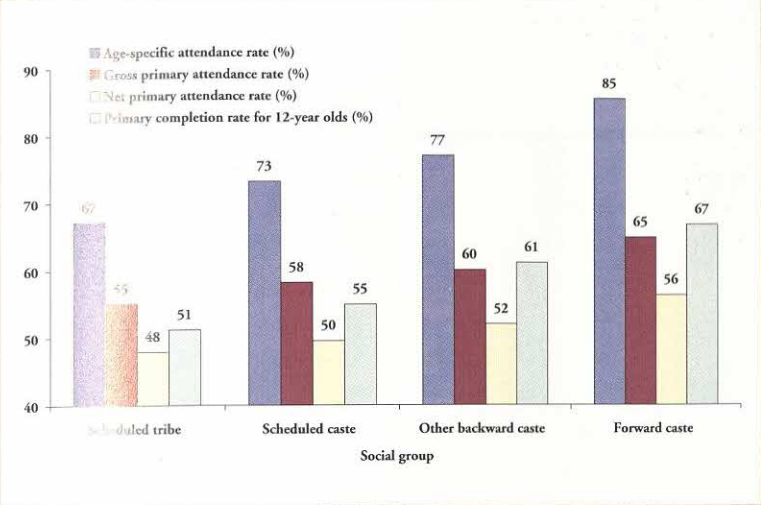
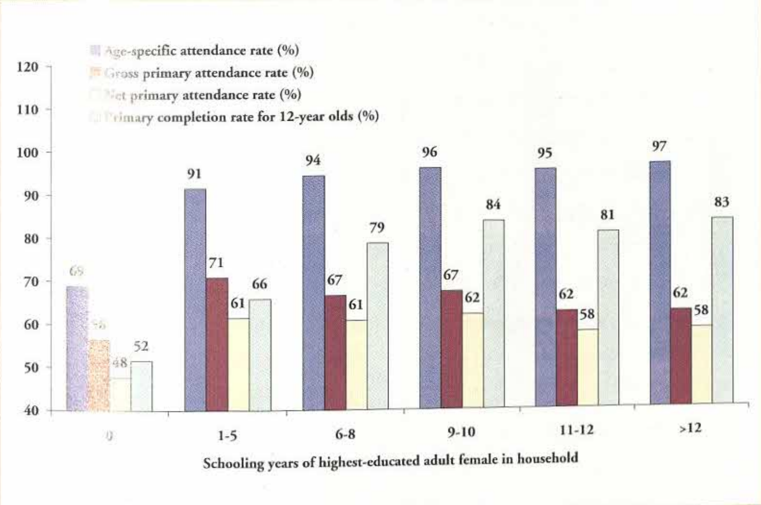


Figure IV.18 : School attendance rates (ages 6-11) and primary completion rate for 12-year olds, by female education, 1999-2000



However, the situation is different with respect to primary completion. In this case, the number of (non-zero) years of schooling of the adult female in the household makes an important difference. In households where the adult female has 1-5 years of schooling, the primary completion rate is 66%, but it increases to more than 80% with more than 8 years of schooling.

Infrastructure and Schooling

The NSS data also suggest that access to infrastructure is associated with higher primary school attendance and completion rates. Districts having greater electricity coverage not only have higher age-specific, gross and net primary attendance rates but also higher primary completion rates (Figure IV.19). The evidence is somewhat more mixed with respect to access to roads. Primary school attendance does not vary much with better road access. However, better road access does seem to improve primary completion rates (Figure IV.20).

Teachers and Primary Completion Rates

Since the pupil-teacher ratio is often considered an indicator of school quality, one might expect this ratio to be associated with primary completion rates. However, the NSS 55th round data do now show any significant association between the two variables. While the primary completion rate for 12-year olds falls as the number of pupils per teacher goes from below 40 to between 41 and 50, it is greatest in districts where the pupil-teacher ratio is above 50. The lack of association may reflect other factors at work, such as teacher absenteeism or the socio-economic background of students.

One major program launched by the Government of India to address quality issues was Operation Blackboard. Under this program, the Government provided a second teacher to all single-teacher primary schools and a teaching-learning equipment packet to all primary schools. Between 1987, when the program began, to 1994, when all the originally-targeted schools had been served, Operation Blackboard accounted for over half of central government

Figure IV.19 : School attendance rates (ages 6-11) and primary completion rate for 12-year olds, by access to electricity, 1999-2000

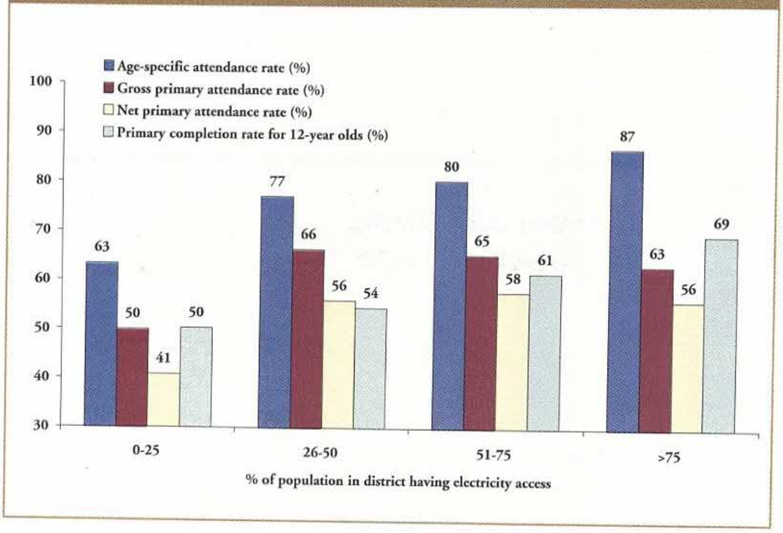
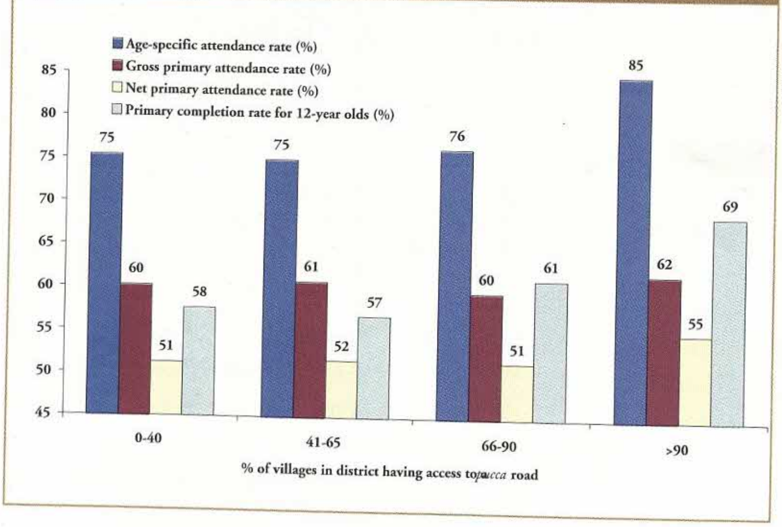


Figure IV.20 : School attendance rates (ages 6-11) and primary completion rate for 12-year olds, by access to *pucca* roads, 1999-2000



spending on elementary education and extended to virtually every district of the country. On average, Operation Blackboard added two teachers for every 1,000 primary-school-aged children and increased the stock of primary school teachers by 10%.

A rigorous econometric evaluation of Operation Blackboard, using multiple rounds of the National Sample Surveys, a census of school resources (the All-India Educational Survey), and Operation Blackboard administrative data, found that, despite substantial misallocation of Operation Blackboard teachers by state and local governments, the program did reduce the prevalence of single-teacher schools and increase the number of teachers per school (Chin 2002). The study also concluded that the teacher component of Operation Blackboard significantly raised primary school completion and literacy rates for girls, but there was no such effect for boys. Girls' primary school completion increased by 3-4 percentage points, and girls' literacy increased by 2-3 percentage points. Thus, Operation Blackboard not only induced illiterate girls who otherwise would never have attended school to attend, but also induced literate girls who otherwise would have dropped out to stay in school. Thus, the study suggests that improvements in school quality - in particular, the availability of additional teachers in schools - may be a viable way of retaining girls in primary school.

Teacher Pay

To what extent does teacher pay influence teacher performance and student achievement? Using data from a sample survey of 902 students and 172 teachers across 20 government-funded and 10 private schools in India, Kingdon and Teal (2002) explore the evidence for the payment of performance-related pay and the extent to which such pay structures impact on student achievement. They find that, even after controlling for student ability, parental background, and indicators of teacher and school quality, students in private schools get significantly better academic results (as measured by tests of numeracy and literacy) by relating teacher pay to achievement. However, this association is not observed for government schools, reflecting the fact that since government teaching jobs in India are typically permanent contracts with virtually no power of dismissal, higher wages have little influence on teacher motivation in the public sector. On the other hand, the flexibility that the private education sector has to set wages and dismiss lax teachers allows school managers to use teacher wages as incentives to enhance teacher performance.

Teacher Absenteeism

Since retention of students in primary schools depends upon the type and caliber of instruction they receive, primary completion rates are likely to be more sensitive to teacher absenteeism than enrollment rates. In a study of schools in Uttar Pradesh, Dreze and Gazdar (1997) argue that "... the specific problem of teacher absenteeism and shirking ... is by far the most important issue of education policy in Uttar Pradesh today." Dreze and Gazdar came to this conclusion after finding that two-thirds of the teachers were absent from their positions during announced visits to 16 schools in the state. A study by PROBE (1999), based on visit to over 200 primary schools across the country, found that the head teacher (or principal) was absent in nearly a third of the schools on the day of the survey team's visit. A recent national survey focusing on service delivery in primary health centers and primary schools found that, on average, one-quarter of India's primary school teachers were not present at the schools where they are supposed to teach on any given day[71] — rates that are high in comparison to those observed in other countries (World Bank 2003). The problem of absenteeism appears to be much worse in the poorer states, with 39% of primary school teachers being absent on any given day in Bihar (Chaudhury et al. 2003).

One reason for the high rates of teacher absenteeism may be extensive involvement of teachers in politics. Kingdon and Muzammil (2003) cite the case of Uttar Pradesh, where there has been significant penetration by teachers into state politics, in large part due to a constitutional provision for their reserved representation in the upper house of the state legislature.[72] This has led to significant lobbying and union activity by the teachers and has earned them substantial salary gains and other monetary benefits from the state government. The salary gains have crowded out public spending on other items of expenditure, such as instructional materials and supplies and scholarships.[73] In addition, the increased participation of teachers in regional and local politics has diverted them from their teaching responsibilities, and may in part be the reason for the high rate of absenteeism. Of course, the problem of teacher absenteeism goes far beyond the politicization of teachers; it reflects a general lack of accountability of teachers and schools — indeed, the entire educational system — to students and the community.

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[71] The absence rate is the percentage of staff that is supposed to be present but is not on the day of an unannounced visit. It includes both authorized and unauthorized absences. In fact, most teacher absences in schools may be authorized absences (Howes and Murgai 2004). For example, the PROBE study observed that of the 200 days of potential teacher attendance during a year, teachers had valid reasons to be absent from school for 50 days (or 25%): 20 days of holidays and permitted leave, 21 days of non-teaching duties (including deputation and in-service training), and 9 days for collection of salaries (PROBE 1999). Thus, the high absence rate likely reflects generous leave terms and significant non-teaching duties assigned to teachers. Whether teacher absences are authorized or unauthorized, they reflect the general lack of accountability of the public school system to the students they are supposed to serve. There is evidence that the amount of academic instructional time in a school influences student outcomes, especially in government schools. The study by Kingdon and Teal (2002) mentioned above found that a one percent increase in the minutes of academic instruction per week in a government school increased student test scores in that school by almost 0.5 percent. This would seem to suggest that teacher absences, whether authorized or unauthorized, are likely to have a large deleterious impact on student achievement.

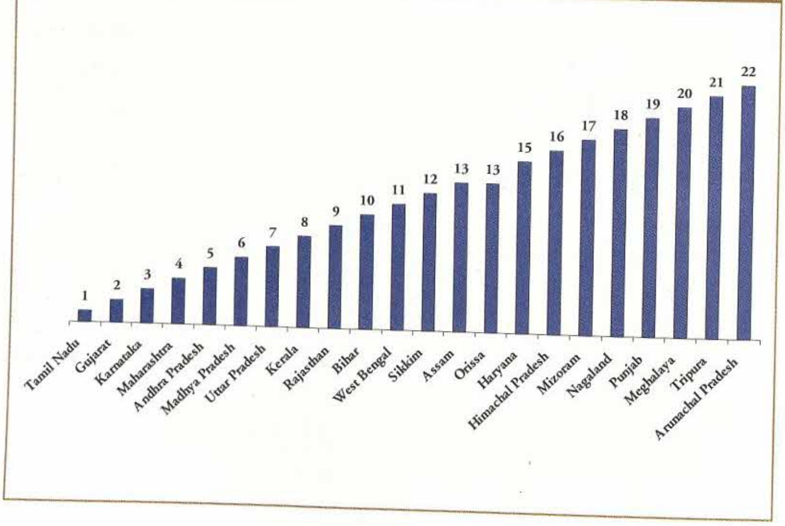
[72] Government school teachers are barred from contesting for elections to the *lower* house of the state legislature. However, teachers in government-aided, private schools are not similarly debarred from elections.

[73] It is estimated that a Rupee spent on providing a full packet of instructional materials in schools improves test scores by 14 times as much as a Rupee spent on teacher salaries and 12 times as much as a Rupee spent on school facility improvement.

In contrast to Chaudhury et al. (2003), a national survey conducted by the Public Affairs Centre, which ranked the performance of government school education services on a number of indicators, such as access to a government primary school within a kilometer from the place of residence, proportion of households sending their children to government primary schools, and user satisfaction with the behavior of teachers and with the quality of school facilities, found that the poor states (with the exception of Orissa) did not quite rank at the bottom of all the states in the country. The Northeastern states, Punjab, and Haryana ranked lower than Bihar, Madhya Pradesh, and Uttar Pradesh in terms of the quality of their public school education services (Figure II.21) (PAC 2002).[74]

Reducing teacher absenteeism and making schools accountable to students and the community is no simple task, however. As the *World Development Report 2004* points out, it requires broad-ranging institutional reform, incorporating, among other things, empowerment of citizens and communities who can hold the state accountable for performance, devolution of administrative and financial powers to communities, greater autonomy to schools, involvement of parents in school management, and ensuring the motivation of front-line workers. A good example of an intervention that seeks to motivate front-line providers to improve the delivery of services is the Learning Guarantee Program, launched in the poor and backward districts of Karnataka by the state government and the Azim Premji Foundation. The program aims to improve access and learning outcomes by introducing competition among government schools for performance-related awards (See Box IV.2 for a description of the program).

Figure IV.21: Ranking of states in the performance of government school education services, 2002



Multivariate Analysis of Primary Attendance and Completion

To examine the likelihood of the various states in India attaining the child schooling MD goals, we have estimated a multivariate model of school attendance and primary attendance for 6-11 year olds and primary completion for 12-year olds, using the NSS 55th round unit record data (at the child level).[75] The multivariate model has the advantage of controlling for several variables that are simultaneously associated with child schooling. The estimation results are reported in Annex Tables 4 and 5, while only the broad findings of the empirical analysis are discussed here.

The multivariate model confirms many of the bivariate relationships shown in the graphs above. While the probability of attending school or primary school increases with age, girls at each age have a significantly lower probability of school and primary school attendance. Further, the gender disparity in attendance rates appears to increase with age. Since primary completion is considered only for 12-year olds, age comparisons in primary completion are not relevant. However, the results do suggest the importance of gender, with 12-year old girls being nearly 4% less likely to complete primary school than 12-year old boys.

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[74] This is in contrast to the finding of the same (PAC) survey that the poor states ranked in the bottom half of all the states in the country in terms of the quality of their public *health* services.

[75] Since the dependent variables in all three models are dichotomous (i.e., assuming a value of zero or one), the models have been estimated by the maximum-likelihood probit method.

The schooling of the highest-educated adult male or female in a household is significantly associated with school attendance and completion — more so than the schooling of the household head or the head's spouse. Adult female schooling typically has a smaller association than adult male schooling with school and primary school attendance, but the opposite is true with respect to primary completion.

Even after controlling for log of monthly consumption expenditure per capita, historically-disadvantaged social groups, such as Scheduled Castes, Scheduled Tribes and Other Backward Castes, have significantly lower attendance and completion probabilities than forward castes, with Scheduled Tribes being generally the worst-off group. Likewise, Muslims consistently have lower attendance and completion rates than non-Muslims. The differences across social and religious groups are large; for instance, children aged 6-11 belonging to Scheduled Tribes have a 16% lower probability of attending school than children not belonging to Scheduled Tribes, and Muslim children aged 12 years have a 21% lower probability of having completed primary school than non-Muslim children.

A household's living standards, as proxied by the log of its monthly consumption expenditure per capita, are strongly associated with school attendance and primary completion. Likewise, the log of gross domestic product per capita in an individual's state of residence has significant positive associations with all three measures of school enrollment and completion. Even after control for gross state domestic product per capita, the log of government expenditure on elementary schooling per child 6-14 years in a state is strongly associated with *primary* school attendance and primary completion but not with overall school attendance.[76]

We have merged data on the number of cognizable kidnappings of women and girls per capita in a district with the NSS household survey data to examine the association between crime against women and the school attendance and completion rates of girls. The empirical results suggest that crime against women is associated with a significant decline in female school attendance, female primary school attendance, and primary completion rates. The magnitude of the estimated coefficients are, however, not overly large.

Infrastructure has predictable associations with school attendance and completion, with access to electricity having the strongest associations. Access to roads is not significantly associated with school and primary school attendance among 6-11 year olds, but it is significantly associated with the probability of children completing primary school.

An interesting question is the extent to which the quantity and quality of school infrastructure in a community are associated with school attendance and completion rates. The availability of primary schools per 1,000 children aged 6-11 in a district — an indicator of schooling quantity — is strongly associated with school and primary school attendance among 6-11 year olds, but it has no significant association with primary completion rates. On the other hand, lowering the pupil teacher ratio at the primary level in a district — an indicator of increased schooling quality — is associated with higher rates of school attendance and primary completion. This suggests that school attendance is currently constrained by the availability of primary schools,[77] while both school attendance and primary completion would likely benefit from school quality improvements in the form of a reduction of the pupil teacher ratio.[78, 79]

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[76] As an alternative, state fixed-effects models were estimated, wherein a set of 23 state dummy variables replaced the two state-level variables (viz., log of gross state domestic product per capita and log of state government elementary expenditure per child 6-14). Although the state dummy variables were significant as a whole at the 5% level, the explanatory power of the regressions, as measured by a pseudo R-squared measure, did not increase much with the substitution of the state fixed effects for the state-level variables. The pseudo R-squared measures increased from 0.20 to 0.21, 0.06 to 0.07, and 0.09 to 0.13 in the case of school enrollment, primary enrollment and primary completion, respectively. This suggests that the state fixed effects models are not superior to the models reported here in terms of goodness-of-fit.

Simulations to 2015

Based on the multivariate probit models discussed above, we have undertaken simulations of the school attendance, primary school attendance and the primary completion rate for the poor states under different intervention scenarios. These are shown in Table IV.1 below. If the poor states were simply brought up to the national average in terms of the nine interventions considered — viz., better road and electricity access, increased adult male and female schooling, household income (consumption) growth, growth in public spending on elementary education per child, reduced crimes against women, expanded number of primary schools per 1,000 children, and reduction in the pupil teacher ratio at the primary level — the cumulative increases in the school attendance, primary school attendance, and primary completion rates would be 7.3, 7.1, and 6.9 percentage points (or 10%, 14.3%, and 12.4%), respectively. If the magnitude of the interventions were to be scaled up, so as to bring the poor states to the average level of the non-poor states, the cumulative increase in school enrollment and completion would be significantly larger. The school attendance, primary school attendance, and primary completion rates in the poor states would increase by 20.7, 19.8, and 20.6 percentage points (or 28.4%, 39.8%, and 38.3%), respectively. The largest increases in school attendance and primary completion are obtained with improved living standards, expanded access to electricity, and increased government expenditure on elementary schooling.

We have also undertaken simulations of the increase in the school attendance and the net primary school attendance rate in the poor states of the country under the assumption that eight interventions are pursued simultaneously and gradually every year up to 2015. The nature and magnitude of these assumed interventions are shown in Table IV.3. As noted in earlier chapters, the policy scenario assumed for the simulations is hypothetical. Figure IV.22 shows changes in the projected school attendance rate for 6-11 year olds in the poor states to 2015, under the assumption that all of the interventions are pursued simultaneously. The school attendance rate is projected to increase by 31.5 percentage points by 2015 — enough to attain universal primary enrollment. Most of the interventions, with the exception of a reduction in the incidence of crimes against women and a reduction in the pupil-teacher ratio in primary schools (both of which have statistically significant but numerically small associations), are associated with appreciable increases in the school attendance rate.

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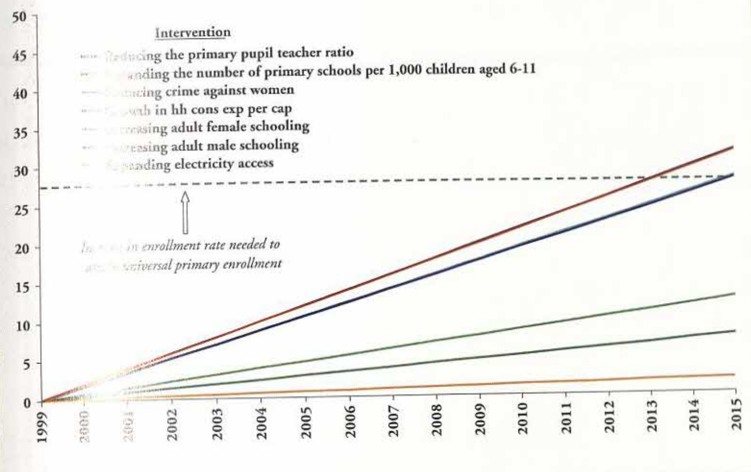
[77] Naturally, given the linear prediction, this result would hold only up to some limit.

[78] Lanjouw and Ravallion (1999) find that government educational expenditures that expand access are better targeted to poor people than resources that exclusively raise quality, since poor students are almost always the last to be enrolled and the better-off are typically already in school. A study for Kenya that looked explicitly at quantity (number of schools) and quality (teacher-pupil ratio) improvements also found that an expansion in the number of school facilities increased the enrollment of children in the poorest expenditure quintiles but had no impact on the enrollment of children in the top quintiles. On the other hand, an improvement in the teacher-pupil ratio increased the enrollment rate of children in the top quintiles, but actually reduced the enrollment of children in the poor quintiles (Deolalikar 1998).

[79] Another study by Duflo (2001) found that the construction of 61,000 primary schools by the Indonesian Government between 1973 and 1978 - one of the largest school construction programs on record - led to a large increase in schooling. On average, children aged 2-6 in 1974 received 0.12-0.19 more years of schooling for each school constructed per 1,000 children in their region of birth.

Figure IV.22 : Increase in projected % of children aged 6-11 attending school in the poor states, 1999-2015, under different intervention scenarios
(graph shows cumulative effect of each additional intervention)



However, the situation is very different with respect to the *net primary* attendance rate. Figure IV.23, which shows the projected increases in the net primary attendance rate in the poor states, shows that rate increasing by only about 27 percentage points by 2015 — well short of the 50 percentage points needed to attain the MD goal. The relative ranking of different interventions in raising the net primary attendance rate is similar to that of interventions to raise the overall school attendance rate, with the exception of per-child government expenditure on

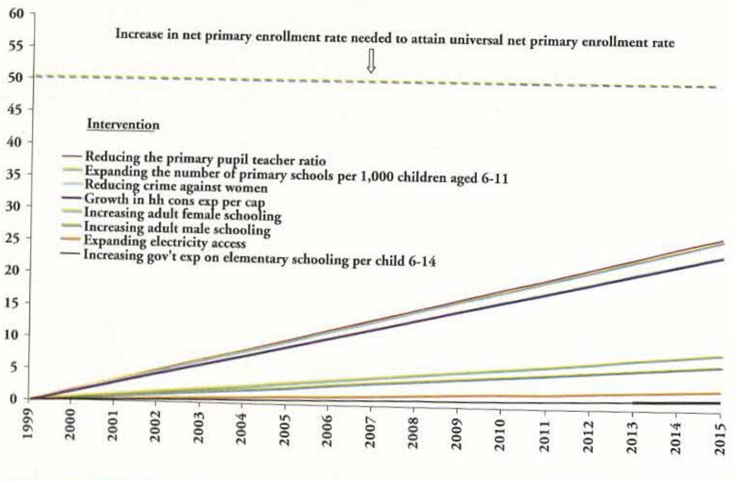
Table IV.1 : Projected increase in school attendance and primary completion rates (percentage points) with various interventions in the poor states

	Bringing poor states to the level of the national average			Bringing poor states to level of the non-poor states' average		
Intervention	School attendance	Primary school attendance	Primary completion	School attendance	Primary school attendance	Primary completion
Male schooling (years)	0.5	0.3	0.1	1.5	1.0	0.9
Female schooling (years)	0.6	0.2	0.6	1.8	0.6	2.1
Monthly per capita consumption expenditure	3.4	3.6	2.9	10.6	11.1	9.0
Annual government expenditure on elementary education per child 6-14 years		0.5	1.3		1.4	3.6
Number of cognizable kidnappings of women and girls per 100,000 population in district	0.0	0.0	0.0	0.1	0.1	0.3
% of villages in district connected by *pucca* road			0.3			0.7
Access to electricity in district (%)	1.6	1.1	1.2	4.9	3.7	3.4
Number of primary (grades 1-5) schools per 1,000 children aged 6-11 in district (x 1000)	0.9	0.6		1.4	0.9	
Pupil teacher ratio in primary schools (grades 1-5) in district (x 1000)	0.4	0.7	0.4	0.4	1.0	0.6
Sum of all interventions	7.3	7.1	6.7	20.7	19.8	20.6

Table IV.2 : Assumptions about various interventions to increase the school attendance and the net primary school attendance rate in the poor states, 1999-2000 to 2015

Intervention	Starting value in 1999-2000	Assumed change per year	Ending value in 2015
Adult male schooling (years)	4.5	0.25	8.5
Adult female schooling (years)	2.0	0.3	7.8
Government expenditure on elementary education per child aged 6-14 (Rs.)	955	4%	1,789
Consumption expenditure per capita (Rs.)	409	3%	656
Population coverage of electricity (%)	42.5	1% point	58.5
Crime against women (no. of female kidnappings and rapes per 100,000 pop.)	1.65	-0.05	0.85
No. of primary schools per 1,000 children aged 6-11	5.1	0.2	8.3
Pupil teacher ratio in primary schools	91	-1.0	75

Figure IV.23 : Increase in projected % of children aged 6-11 attending primary school in the poor states, 1999-2015, under different intervention scenarios
(graph shows cumulative effect of each additional intervention)

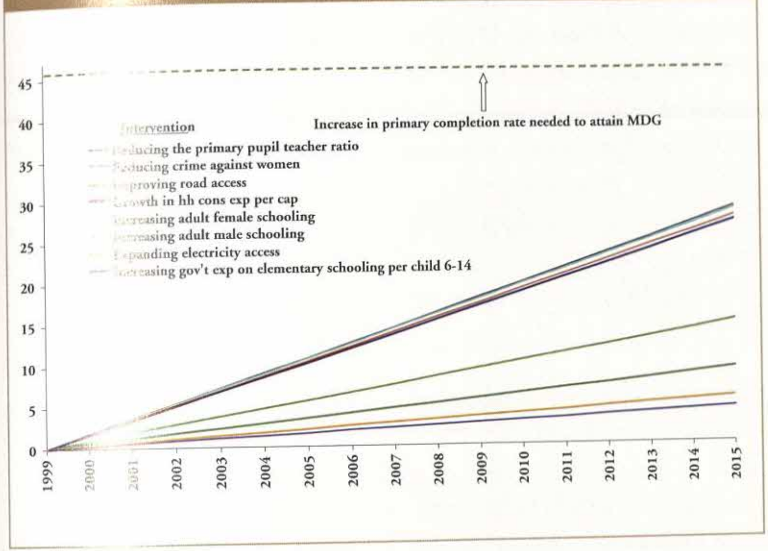


elementary schooling, which has a significant association with the net primary attendance rate but not with the overall school attendance rate.

These results suggest that while it may be possible to get all children aged 6-11 in the poor states into school with concerted action on many fronts, raising the *net primary* enrollment or attendance rate to 100% by 2015 will be extremely challenging. Of course, the relative importance of ensuring that all children aged 6-11 are in school versus ensuring that all children aged 6-11 are attending *primary* school is debatable. Certainly, for the poor states of India, even ensuring that all children aged 6-11 are in school (irrespective of level) will be a worthwhile and laudatory achievement.

The findings of a comparable analysis of primary completion rates in the poor states of the country are depicted in Figure IV.24. The interventions considered for primary completion are largely the same as those for primary enrollment, with two exceptions. First, as the number of primary schools per 1,000 children aged 6-11 is not significantly associated with primary completion, it is dropped from the projections shown in Figure IV.25. Second, as the availability of village roads is significant in explaining primary completion (but not primary enrollment), it is included in the projections. We assume

Figure IV.24 : Increase in projected primary completion rate (%) in the poor states, 1999-2015, under different intervention scenarios (graph shows cumulative effect of each additional intervention)



that the percentage of villages connected to a *pucca* road in the poor states increases by one percentage point each year — from 60% in 1999 to 76% in 2015.

As observed in Figure IV.24, the net primary completion rate is projected to increase by about 29 percentage points by 2015, which is well short of the 46 percentage point increase that would be needed to attain the MD goal of 100% primary completion, but nevertheless represents significant progress. The largest improvements in the completion rate occur with an increase in living standards, followed by an expansion of female adult schooling and public spending on elementary education per child 6-14. Increases in adult male schooling and improved electricity coverage also are associated with smaller, but significant, associations with the primary completion rate.

The main implication of the findings presented in this chapter is that attaining the MDGs relating to universal net primary enrollment and 100% primary school completion will be extremely challenging in the poor states. Nevertheless, large gains in both of these indicators are possible, given economic growth, improved infrastructure, and increased public spending on elementary education. In addition, the same package of interventions should be successful in getting all children aged 6-11 years attending school.

Why do the simulations suggest attainment of the education-related MDGs to be a more challenging task than the attainment of the infant mortality- and child underweight-related MDGs? In part, this reflects the large discrepancy between the goals and the current status of the various MD indicators in the poor states of the country. The net primary enrollment rate in the poor states was only about 50% in 1999-2000. To attain universal net primary enrollment, the poor states in the country would have to double the net primary enrollment rate by 2015. In contrast, the infant mortality-related MDG calls for a reduction of about 60% in infant mortality in the poor states (from a level of 76 infant deaths per 1,000 live births in 1998-99 to a level of 31 by 2015). Likewise, the underweight-related MDG calls for the proportion of underweight children in the poor states to be reduced by about 46% by 2015 — from a level of 51% in 1998-99 to 27% by 2015. Thus, the absolute nature of the education-related MDGs (viz., the target being unrelated to the starting point) creates a large challenge for the poor states in the country that have very low rates of net primary enrollment and primary completion.

As part of its commitment to universalizing access to elementary schooling and ensuring completion of elementary schooling by 2010, the Government of India has launched the National Program of Universal Elementary Education (UEE), known in Hindi as *Sarva Shiksha Abhiyan* (SSA). (See Box IV.3 for a description of the SSA.) The Program not only is consistent with the Millennium Development Goals (MDGs) for education, but goes beyond it in covering 8 years of primary schooling, under a much tighter time frame. Among the quantitative goals of the SSA are: all children to complete five years of primary schooling by 2007; all children to complete eight years of schooling by 2010; no gender and social disparities in primary schooling by 2007 and in elementary schooling by 2010; and universal retention of children in elementary schools by 2010. The SSA is a centrally sponsored scheme (CSS) whereby the Union Government provides incremental resources in a cost-sharing arrangement with the states: 85:15 in the 9th Plan (FY 2001), 75:25 in the 10th Plan (FY 2002-06), and 50:50 in the 11th Plan (FY 2007-10). The SSA anticipates that Rs. 600 billion of additional resources will be required from the budgets of the central and state governments over the next 10 years to attain the SSA goals.

The simulations shown in Figure IV.22-IV.24 suggest that it will be very difficult to meet the government's goal of having all children in India enrolled in *primary* schools and completing the full course of primary schooling by 2007. The goal of getting all children aged 6-14 years to complete *eight* years of schooling by 2010 would appear to be even more challenging.

Box IV.1: The Education Guarantee Scheme of Madhya Pradesh

Madhya Pradesh is one of the poorest states in India. It also has one of the lowest levels of school enrollment in the country. In order to remedy this situation and as part of its wide-ranging decentralization program, the government of Madhya Pradesh began the Education Guarantee Scheme in 1997 to ensure access to primary schooling to every child in the State. The EGS represented a community-centered and rights-based approach to universalizing primary education in a quick, time-bound manner. Under the EGS, the Government gave a guarantee to provide a primary school facility to any habitation which did not have such a facility within a distance of a kilometer. Further, the state government was obligated to provide the school within a period of 90 days after receiving the demand for it from the local community.

The EGS represents a three-way partnership among the state government, local governments (typically the village council or *panchayat*), and the community. The community raises the demand, identifies a local resident who could be the teacher in the new school, and provides the space for a school facility. The local government (*panchayat*) appoints the teacher and oversees the functioning of the school. The state government supports the school through a grant to cover the teacher's salary, arranges for the training of the teacher, and provides teacher-learning material and other inputs for quality.

Within a year of its introduction, the EGS created a primary school facility in every habitation of the State. Indeed, during 1997 — the first year of the scheme's operation — there were 40 new primary schools that opened every day, suggesting the enormous unmet demand for schooling that existed in the state. By August 1998, Madhya Pradesh had a primary school facility in every habitation. Thus, within a short period of 18 months, the state eliminated the historical backlog of schooling — at one-third the usual cost of establishing new school facilities. The EGS did not merely provide physical access; more importantly, it provided social equity, with the new school facilities being largely demanded to bring primary schooling to Scheduled Tribes and girl children. The EGS has become a national model for a community-based approach to universalizing primary schooling in India.

While there have been no rigorous evaluations of the EGS, some studies suggest that schooling access for the poorest 40% of households increased more rapidly in Madhya Pradesh between 1992-93 and 1998-99 ("before EGS" and "after EGS" years for which national survey data are available) than in the rest of India (McCarten and Vyasulu 2003). An econometric evaluation of the central government's District Primary Education Program (DPEP-I) also found that Madhya Pradesh was the only state (of a total of 7 states considered) which showed significant impacts of DPEP-I on school attendance rates among 6-10 year olds (Jalan and Glinskaya 2003).

Box IV.2: The Learning Guarantee Program in Karnataka

In 2002, the Azim Premji Foundation, in collaboration with the Government of Karnataka, launched the Learning Guarantee Program, which is aimed at guaranteeing the learning of children in government schools. All government higher and lower primary schools (approximately 10,000) situated in the 43 blocks of the northeastern districts of Karnataka State (identified as most backward) were eligible to participate in this competition. Between 2002-03 and 2004-05, when the program will end, participating schools will have three opportunities to enter the competition and improve their capabilities.

The program is essentially a competition, with rewards and recognition schemes for teachers and children of schools which demonstrate an improvement in student learning. To encourage schools to both expand access and improve quality of learning, the program rewards schools on the basis of learning outcomes *in the school's habitation* (not the school's population). If a minimum of 60% of all children in the school's habitation demonstrate, in an independent assessment, that they have acquired 90% of the prescribed competencies in mathematics and Kannada (the regional language of Karnataka), the school would receive an award of Rs. 5,000. With 70% of the children in the habitation acquiring the expected learning outcomes, the reward would be Rs. 10,000. Finally, a school that demonstrates 80% of children in the habitation achieving the expected learning outcomes qualifies for the highest reward of Rs. 20,000. Thus, a school can win a maximum of Rs. 60,000 in the three rounds of the competition.

In the first year of the program, nearly 1,000 schools offered themselves for evaluation. Many more are expected to opt into the program in the second and third years.

The Learning Guarantee Program is an attempt to encourage government schools to deliver learning outcomes and to make them accountable for the services they deliver. It is expected that the LGP will enable primary stakeholders (parents and the community) to put pressure on their children's schools to become a certified Learning Guarantee school. It is also expected that 'Learning Guarantee' schools will motivate out-of-school children to enroll in school and encourage the children in school to continue (and not drop out). By fostering healthy competition among all communities, the program is likely to both improve access and quality.

Source: Azim Premji Foundation (2002).

Box IV.3: The *Sarva Shiksha Abhiyan*: A Program for Universal Elementary Education in India

In accordance with the constitutional commitment to ensure free and compulsory education for all children up to the age of 14 years, provision of universal elementary education has been a salient feature of national policy since independence. This resolve has been spelt out emphatically in the National Policy since independence (NPE), 1986 and the Program of Action (POA) 1992. A number of schemes and Programs were launched in pursuance of the emphasis embodied in the NPE and the POA. These included the scheme of Operation Blackboard (OB); Non Formal Education (NFE); Teacher Education (TE); Mahila Samakhya (MS); State specific Basic Education Projects like the Andhra Pradesh Primary Education Project (APPEP); Bihar Education Project (BEP), Lok Jumbish (LJP) in Rajasthan; National Program of Nutritional Support to Primary Education (MDM); and the District Primary Education Program (DPEP).

The *Sarva Shiksha Abhiyan* (SSA) is a historic stride towards achieving the long cherished goal of Universalization of Elementary Education (UEE) through a time-bound integrated approach, in partnership with States. SSA, which promises to change the face of the elementary education sector of the country, aims to provide useful and quality elementary education to all children aged 6-14 years by 2010.

The SSA is an effort to recognize the need for improving the performance of the school system and to provide community-owned quality elementary education in the mission mode. It also envisages bridging of gender and social gaps.

Objectives of the SSA

- All children in school, Education Guarantee Centre, Alternative School, 'Back to School' camp by 2003;
- All children complete five years of primary schooling by 2007;
- All children complete eight years of schooling by 2010;
- Focus on elementary education of satisfactory quality with emphasis on education for life;
- Bridge all gender and social category gaps at primary stage by 2007 and at elementary education level by 2010;
- Universal retention by 2010.

Structure for Implementation

The Central and State governments will together implement the SSA in partnership with the local governments and the community. To signify the national priority for elementary education, a National SSA Mission is being established with the Prime Minister as the Chairperson and the Union Minister of Human Resource Development as the Vice Chairperson. States have been requested to establish State level Implementation Society for UEE under the Chairmanship of Chief Minister Education Minister. This has already been done in many States.

The SSA will not disturb existing structures in States and districts but would only try to bring convergence in all these efforts. Efforts will be made to ensure that there is functional decentralization down to the school level in order to improve community participation. Besides recognizing PRIs/Tribal Councils in Scheduled Areas, including the Gram Sabha, the States would be encouraged to enlarge the accountability framework by involving NGOs, teacher, activists, and women's organizations.

Coverage and Period

The SSA will cover the entire expanse of the country before March 2002 and the duration of the Program in every district will depend upon the District Elementary Education Plan (DPEP) prepared by it as per its specific needs. However, the upper limit for the Program period has been fixed as ten years, i.e., up to 2010.

Strategies Central to SSA

Institutional reforms — As part of the SSA, institutional reforms in the States will be carried out. The state will have to make an objective assessment of their prevalent education system including educational administration, achievement levels in schools, financial issues, decentralization and community ownership, review of state

Box IV.3 (cont'd): The SSA

Education Act, rationalization of teacher deployment and recruitment of teachers, monitoring and evaluation, education of girls, SC/ST and disadvantaged groups, policy regarding private schools, and ECCE. Many States have already implemented institutional reforms to improve the delivery system for elementary education.

Sustainable Financing — The SSA is based on the premise that financing of elementary education interventions has to be sustainable. This calls for a long-term perspective on financial partnership between the Central and the State governments.

Community ownership — The Program calls for community ownership of school-based interventions through effective decentralization. This will be augmented by involvement of women's groups, VEC members, and members of Panchayati Raj institutions.

Institutional capacity building — The SSA conceives a major capacity building role for national- and state-level institutions like NIEPA, NCERT, NCTE, SCERT, and SIEMAT. Improvement in quality requires a sustainable support system of resource persons.

Improving mainstream educational administration — The Program will have a community-based monitoring system. The Educational Management Information System (EMSI) will correlate school level data with community-based information from micro planning and surveys. Besides this, every school will have a notice board showing all the grants received by the school and other details.

Habitation as a unit of planning — The SSA works on a community-based approach to planning with habitation as a unit of planning. Habitation plans will be the basis for formulating district plans.

Accountability to community — SSA envisages cooperation between teachers, parents and PRIs, as well as accountability and transparency.

Education of girls — Education of girls, especially those belonging to the Scheduled Castes and Scheduled Tribes, will be one of the principal concerns of the SSA.

Focus on special groups — There will be a focus on the education participation of children from Scheduled Castes and Tribes, religious and linguistic minorities, disadvantaged groups, and disabled children.

Pre-Project phase — SSA will commence throughout the country with a well-planned pre-project phase that provides for a large number of interventions for capacity development to improve the delivery and monitoring system.

Thrust on quality — SSA lays a special thrust on making education at the elementary level useful and relevant for children by improving the curriculum, child-centered activities, and effective teaching methods.

Role of teachers — SSA recognizes the critical role of teachers and advocates a focus on their development needs. Setting-up of BRC/CRC, recruitment of qualified teachers, opportunities for teacher development through participation in curriculum-related material development, focus on classroom process, and exposure visits for teachers are all designed to develop the human resources of teachers.

District Elementary Education Plans — As per the SSA framework, each district will prepare a District Elementary Education Plan, reflecting all the investments being made in the education sector, with a holistic and convergent approach.

Components of SSA

The components of the SSA include appointment of teachers, teacher training, qualitative improvement of elementary education, provision of teaching learning materials, establishment of Block and Cluster Resource Centers for academic support, construction of classrooms and school buildings, establishment of education guarantee centers, integrated education of the disabled, and distance education.

Source: Government of India (2002).

Annex IV.1: Gross Primary Enrollment Rates, Government Elementary Education Expenditure, and Per Capita Income across States, 1980-99

We use twenty years of state-level data on gross primary enrollment rates (GPERs), real gross state domestic product per capita (GSDP), and real public spending on elementary education per child 6-14 years to analyze the association between the gross primary enrollment rate on the one hand and public spending on elementary education and economic growth on the other.[80, 81]

The results of this analysis are reported in Annex Table IV.1 below. OLS estimates indicate a very strong positive association between the gross primary enrollment rate and government expenditure on elementary education per child even after control for per capita GSDP, with a one percent increase in government elementary education spending per child being associated with a 0.17 percent increase in the gross primary enrollment rate. Surprisingly, when control for unobserved heterogeneity across states — in the form of time-invariant state fixed effects — is introduced in the model, the magnitude of the positive association increases (from 0.17 to 0.23). The inclusion of state fixed effects, however, renders the association between the gross primary enrollment rate and per capita GSDP insignificant, indicating that state heterogeneity is positively associated with GSDP. An interaction between the log of government health expenditure and the log of per capita GSDP is negative and significant in the fixed-effects model, indicating that the positive association between the gross primary enrollment rate and public spending on education is weaker at higher levels of per capita state income. It is interesting that these results mirror those obtained for infant mortality (and reported in Annex II.1), also using cross-state, time-series data over the same period.

Unfortunately, time-series data on other covariates of gross enrollment, such as female adult literacy, are simply not available at the state level for the period 1980-99. To rule out the possibility that the significant association between the gross primary enrollment rate and government educational expenditure per child could be due to the omission of female adult literacy from the model, we have calculated state-level averages of the adult female literacy rate from four rounds of the National Sample Survey — for 1983-84, 1987-88, 1993-94 and 1999-2000. The inclusion of female literacy means that the gross primary enrollment rate regression can only be estimated for these four years, which reduces the sample size from 266 to merely 56. However, with one exception, the results continue to indicate a strong positive association between the gross primary enrollment rate and public spending on education and a negative and significant coefficient on the interaction between public spending and per capita GSDP.

The finding that there is a positive association between the gross primary enrollment rate and real government elementary education expenditure per child should not come as a surprise. Additional expenditures increase school capacity (in the form

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[80] Data on government elementary education expenditures were obtained from detailed budget demand documents of individual states. The expenditure variable includes expenditure incurred by a state out of its own revenues as well as central government educational allocations to that state.

[81] A state-level regression of the gross primary enrollment rate on government elementary education spending is based on the assumption that public spending is not endogenously distributed across states (Rosenzweig and Wolpin 1986). Such an assumption may not always hold, especially if government educational expenditures are allocated across states based on literacy conditions. However, the inclusion of state fixed effects in the regression effectively controls for endogenous program placement. We allow for a central planner to distribute public spending on elementary education across states according to an unobserved education/literacy attribute; in other words, states that have innately low literacy rates may spend more on elementary education than those having innately high literacy. Since the fixed-effects model purges the unobserved (time-invariant) literacy attribute from the model, it effectively addresses the endogenous program placement problem.

of both classrooms and teachers), and to the extent that enrollments are capacity-constrained, additional expenditures will allow more children to be enrolled in a larger number of schools and classrooms.

What may be more surprising is that the observed positive association between public spending on elementary education and the gross primary enrollment rate is stronger in the poor states than in the non-poor states. This may simply reflect the fact that schools and school spaces are more limited in the poor states than in the non-poor states, so that an expansion in school capacity results in a greater increase in enrollments in the former than in the latter. As noted earlier in this chapter, there is some support for such a finding from another study on India. Lanjouw and Ravallion (1999) find that the poor in India typically benefit more than proportionately at the margin when there is an overall expansion in primary school enrollments. This happens because poor students are almost always the last to be enrolled, and the better-off are typically already in school. As a result, Lanjouw and Ravallion (1999) argue that government educational expenditures that expand schooling access are generally well-targeted to the poor.[82]

Surprisingly, the econometric results presented in Annex IV.1 do not indicate a strong association between the gross primary enrollment rate and adult female literacy rates in a state, once there is control for both per capita GSDP and per-child education spending.

It is important, however, to interpret these results in the context of the discussion in section H of this chapter. The results do not consider the counter-factual — viz., the improvements in educational outcomes that would occur if the quality of government education expenditures were simultaneously improved via greater accountability in service delivery and better governance. All that these results indicate is the urgent need for investments in additional schools, classrooms, and teachers, to be targeted to the low-enrollment states via an effective and accountability-based delivery system.

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[82] A study for Kenya that looked explicitly at quantity (number of schools) and quality (teacher-pupil ratio) improvements also found that an expansion in the number of school facilities increased the enrollment of children in the poorest expenditure quintiles but had virtually no impact on the enrollment of children in the top quintiles. On the other hand, the same study found that an improvement in the teacher-pupil ratio increased the enrollment rate of children in the top quintiles, but actually reduced the enrollment of children in the poor quintiles (Deolalikar 1998).

Annex Table IV.1 : Fixed-effects, log-linear regression of the gross primary enrollment rate, pooled data for 1980-1999 across Indian states

Independent variable	OLS		Fixed-effects				Fixed-effects with adult female literacy*			
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Ln real gov't elemen. educ. per child 6-14 (G)	**0.173**	4.90	**0.226**	5.67	**2.211**	5.23	**2.490**	2.02	1.36	0.87
Ln real gross state domestic product per capita (Y)	**0.229**	6.74	**-0.034**	-0.47	**1.605**	4.53	**1.951**	1.90	1.97	1.93
Ln G x Ln Y					**-0.225**	-4.71	**-0.268**	-1.95	-0.13	-0.81
Ln adult female literacy (F)							0.175	0.86	2.1	1.33
Ln F x Ln Y									-0.23	-1.23
Time trend (t)	-0.001	-0.46	0.003	0.96	-0.004	-1.04	-0.007	-0.60	-0.005	-0.44
Intercept	**1.504**	5.61	**3.452**	5.33	**-10.946**	-3.51	-13.896	-1.52	-13.6	-1.51
Number of observations	252		252		266		56		56	
F-test for model	35.91		37.72		38		2.98		2.8	
R-squared	0.422		0.808		0.8247		0.7971		0.805	
F-test for state effects			36.00		40.216		4.663		4.465	

Notes: All regressions (with the exception of those marked *) use pooled data across 14 states and 20 years. Dependent variable is log of the gross primary enrollment rate. Data are obtained from various issues of the *Selected Educational Statistics,* state government budget demand documents, and CSO statistics on GSDP of states. All values are in constant 1993-94 Rupees (using state-specific GSDP deflators). Standard errors are corrected for heteroscedasticity using the Huber-white method. **Figures in bold are statistically significant at the 10% or lower level.**

*Data on female literacy are available only for 1983-84, 1987-88, 1993-94 and 1999-2000, so these regressions are restricted to these four years.

Gender Disparity in Schooling

As in other parts of the world, there are large disparities in the economic, social, and schooling opportunities available to men and women in India. Gender disparities begin early in life, with female infants having a lower chance of survival than male infants owing largely to parental neglect of female infants. The discrimination against the female continues as the child grows older — first in the form of smaller rations of food and nutrition (especially for higher-order females) and later in the form of fewer schooling opportunities relative to boys. As women enter the labor force, they face discrimination in the labor market as well, primarily in the form of lower wages.

This paper focuses on gender disparities in schooling opportunities. The MD goal is to eliminate gender disparities in schooling, such that the ratio of girls to boys enrolled at all schooling levels, but particularly at the primary and secondary levels, is 100%.

Trends and Patterns

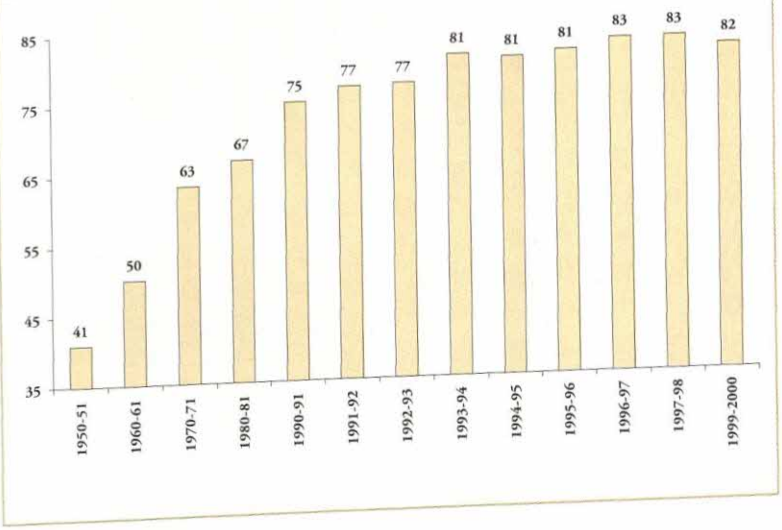
Levels and Trends

School-based administrative data suggest that India has made impressive gains in reducing the male-female gap in the gross primary enrollment rate in the last fifty years (Figure V.1). The ratio of the female to male gross primary enrollment rate nearly doubled from a level of 41% in 1950-51 to 81% in 1993-94, where it has stayed since.[83]

Interstate Variations

There are large interstate variations in the extent of gender disparity in schooling (Figure V.2). The school administrative data indicate that gender disparity is greatest in Bihar, Uttar Pradesh and Rajasthan, where the gross primary enrollment rate for females is about two-thirds or less than that for males. On the other hand, there is parity or near-parity between male and female gross primary enrollment rates in Punjab, Haryana, Sikkim, and Kerala.[84]

Figure V.1 : Ratio of female to male gross primary enrollment rate, 1950-51 to 1999-2000



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[83] As in the previous chapter, primary schooling here refers to grades 1-5.

[84] The observation that Punjab and Haryana have higher rates of female than male primary enrollment deserves an explanation. These states actually have a very different form of gender discrimination in schooling. Since these are rich states, both boys and girls get enrolled in school. However, since there is a growing private sector in these states, parents tend to enroll their male children in private schools while enrolling their daughters in government schools. Since school-based administrative data typically only cover enrollment in government institutions, the boys who are shifted out of the government schools are not counted while the girls attending government schools are counted. This gives a misleading picture of girls having higher enrollment rates than boys.

Figure V.2 : Ratio of female to male gross primary enrollment rate, by state, 1999-2000

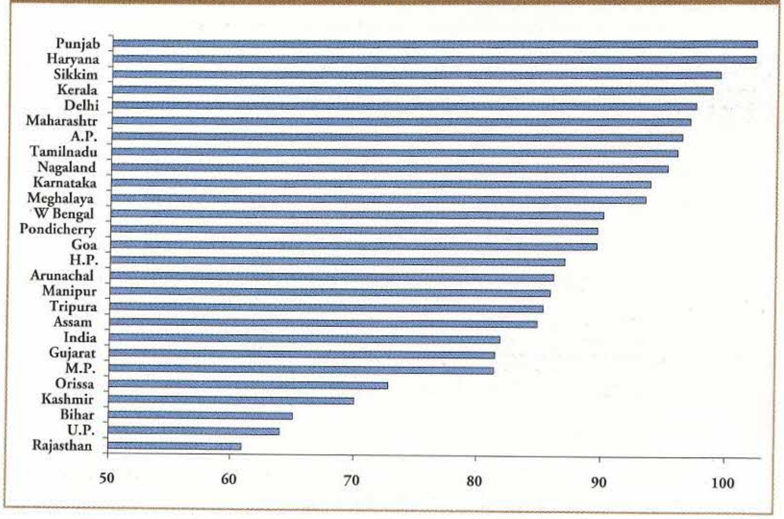
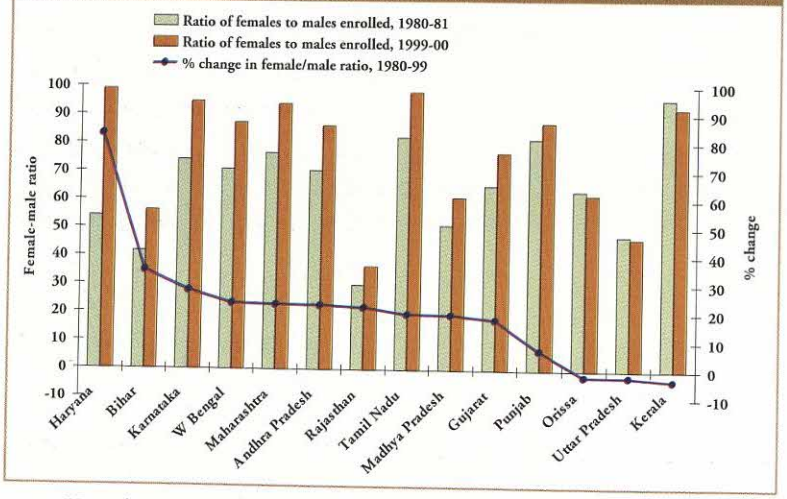


Figure V.3 : Ratio of females to males enrolled in primary (grades 1-5) school, 1980-81 and 1999-2000, by state



How has gender disparity in primary enrollments changed over time across states? Figure V.3, which shows the ratio of females to males enrolled in primary school in 1980-81 and 1999-2000, indicates wide variation in performance across states. The largest relative gains for girls occurred in Haryana, where the ratio of females to males enrolled in primary school almost doubled over the 19-year period. Bihar, Karnataka, and West Bengal also recorded large increases in the ratio of females to males in primary school. At the other extreme, Orissa, Uttar Pradesh, and Kerala experienced small relative declines in the female-male ratio (although it is important to note that the female-male ratio of primary school students was already over 95% in Kerala in 1980-81). In general, states that had low ratios of female to male primary students in 1980-81 experienced somewhat larger percentage increases in the ratio between 1980-81 and 1999-2000 (with Uttar Pradesh and Orissa being major exceptions) (Figure V.4).

Economic Growth, Public Spending, and Gender Disparity

It is not possible to disaggregate government expenditure on elementary education by gender. However, it is possible to see how gender disparity in primary enrollment is associated with both public spending on elementary education and per capita income across states. As in the previous chapter, we have done this by merging state-level data on the ratio of females to males in primary schools over the period 1980-99 with information on real gross state domestic product per capita (GSDP) and real public spending on elementary education per child 6-14.[85]

Figure V.5 suggests that states that spend more on elementary education per child aged 6-14 tend to have higher

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[85] As explained in the previous chapter, data on government elementary education expenditure were obtained from detailed budget demand documents of individual states. Although government expenditure on *primary* education is of interest in this paper, state government expenditure in India are available only for the *elementary* level, comprising the lower primary (grades 1-5) and upper primary (grades 6-8) levels. Note that the state government expenditure data used in this paper includes expenditure incurred by a state government out of its own revenues as well as central government allocations to that state.

Figure V.4 : Percent change in the ratio of females to males enrolled in primary schools, 1980-81 to 1999-2000

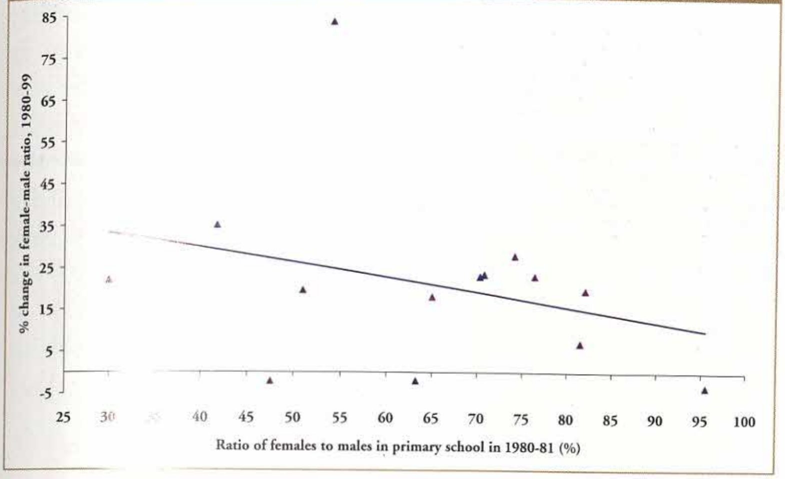


Figure V.5 : Relationship between the ratio of females to males in primary school and real public spending on elementary education per child 6-14, 14 states in 1980-81 and 1999-2000

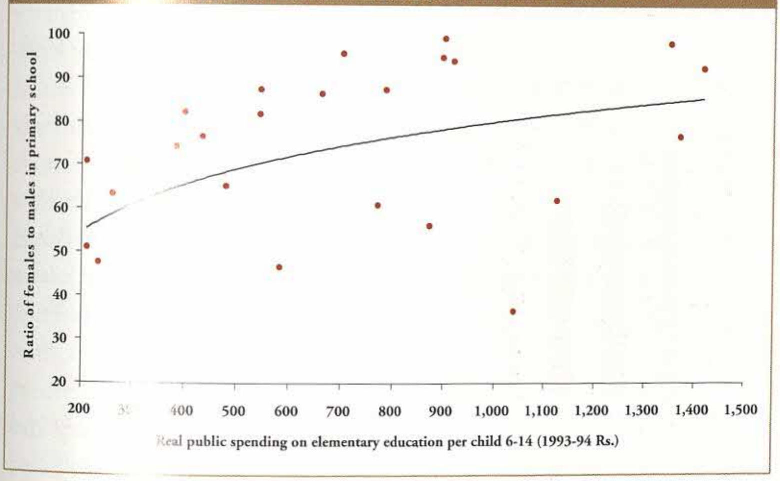
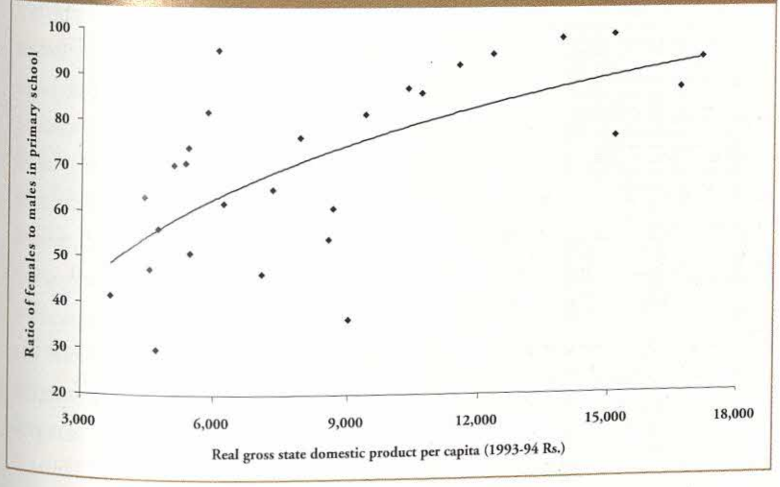


Figure V.6 : Relationship between the ratio of females to males in primary school and real gross state domestic product per capita, 14 states in 1980-81 and 1999-2000



ratios of females to males in primary school. This, in turn, implies that, at the margin, public spending on elementary education is associated with more females than males enrolling in primary school. Figure V.6 shows a similar positive association between gender disparity and state per capita income. States having a higher GDP per capita are observed to have higher ratios of females to males in primary school. There are several reasons for expecting gender equality, at least in primary schooling, to improve with both public spending and per capita income. If parents are more likely to send their male than female children to school in the face of capacity (school, class-room, and teacher) con-straints, additional public spending that would result in a larger supply of schools, classrooms and teachers would benefit primary school-aged girls to a greater extent than boys. Likewise, increases in income per capita and living standards could relax household budget constraints that typically tend to work against the girl child's school attendance.

Household Survey-Based Estimates of Gender Disparity

As noted in the previous chapter, gross enrollment rates obtained from school administrative records differ significantly from household survey-based estimates of enrollment (more appropriately, attendance). Data from the 55th

Figure V.7 : Age-specific and primary school attendance, by gender, 1999-2000

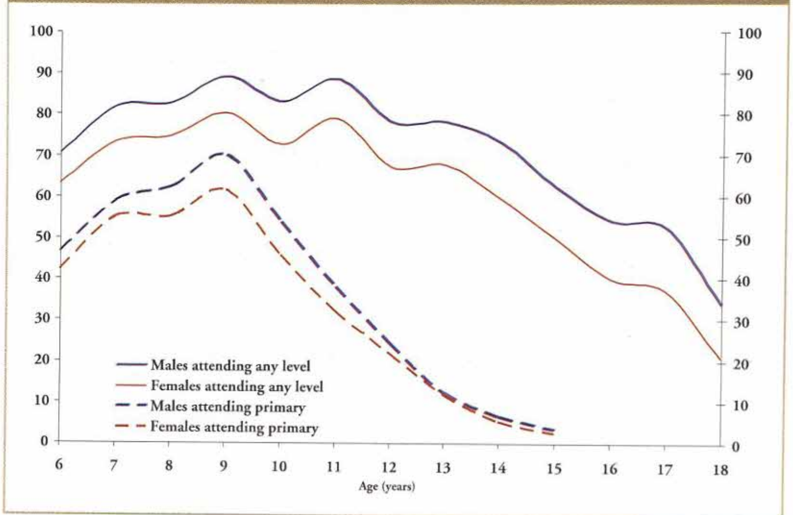


Figure V.8 : Ratio of female to male students attending primary and secondary school, by age, 1999-2000

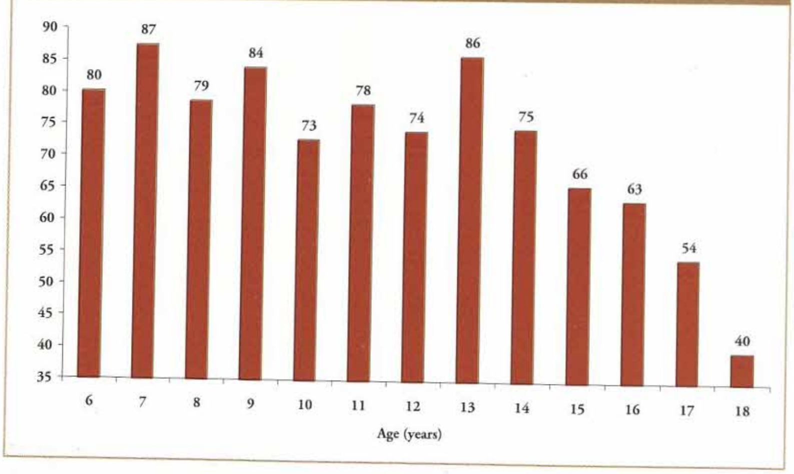
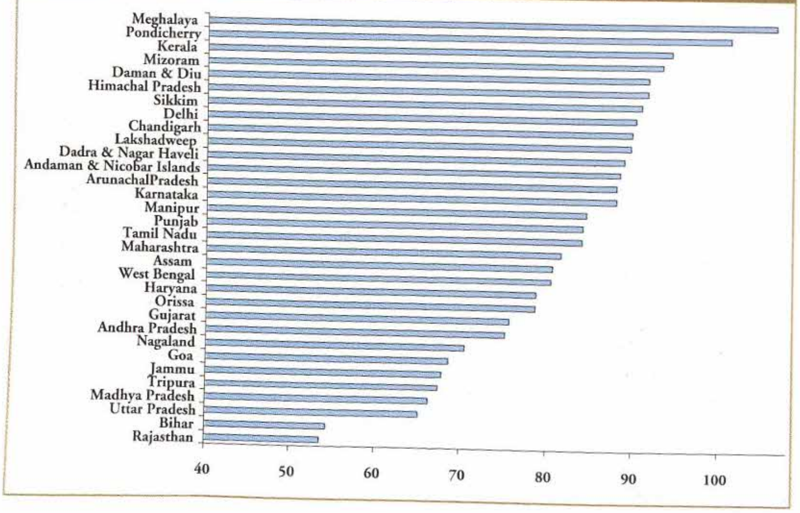


Figure V.9 :Ratio of girls to boys in primary and secondary schools (%), by state, 1999-2000



round of the NSS (undertaken in 1999-2000) show that the female disadvantage in schooling opportunities starts as early as age 6 and continues all the way until age 18 (and beyond) (Figure V.7). However, the female disadvantage manifests itself much more strongly after age 13, as evidenced by the consistently falling ratio of female to male students in primary and secondary school (Figure V.8).

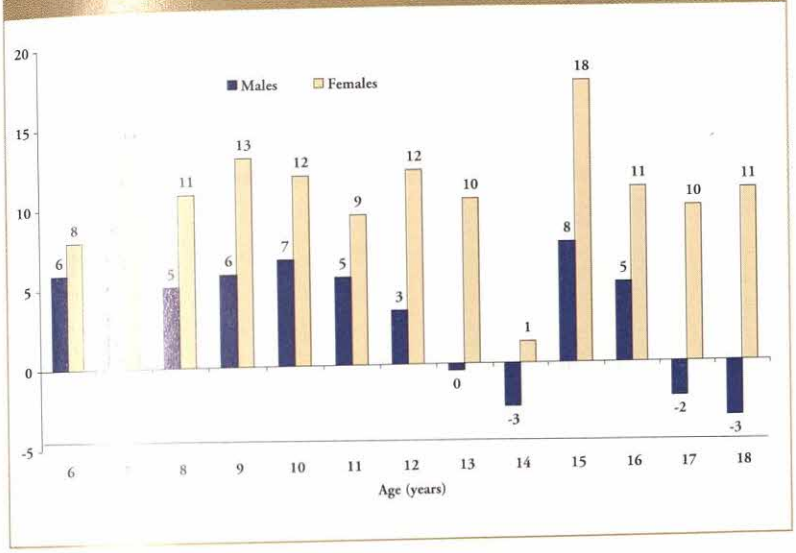
Inter-State Differences

There are large differences across states in the ratio of female to male students at the primary and secondary level (Figure V.9). The Northeastern states, Kerala, and Himachal Pradesh generally have the highest ratios of female to male students, while Madhya Pradesh, Uttar Pradesh, Bihar, and Rajasthan have the lowest ratios. In Bihar and Rajasthan, there are only slightly more than half as many female students as male students at the primary and secondary levels.

Trends

There was, however, some improve-ment in the relative position of females in the latter half of the 1990s. The 50th and 55th rounds of the NSS indicate that, between 1993-94 and 1999-2000, the female school attendance rate increased more than the male attendance rate for every single age group. The disparity between the increases for males and females was greatest for older children, typically aged 13 and above (Figure V.10).

Figure V.10 : % change in age - & gender-specific school attendance rates, 1993-94 to 1999-2000



Intra-State Differences

Regional differences in the ratio of female to male students in primary and secondary school are presented in Annex Table 9. As many as seven regions in the country — in Bihar, Madhya Pradesh, Rajasthan, and Gujarat — had female students constituting less than 60% of male students in primary and secondary schools. Another 18 regions had a ratio of female to male students of less than 75%. This means that, in nearly a third of the regions in the country, female students constitute fewer than three-quarters of male students at the primary and secondary levels.

Even more disconcerting is the finding that, between 1993-94 and 1999-2000, as many as 30 regions (more than a third) experienced a decline in the ratio of female to male students. Surprisingly, these regions are located in such states as Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, and even Kerala (Annex Table 9).

Socio-economic Differences in Gender Disparity

There are some large, and sometimes unexpected, socio-economic patterns in the relative position of girls in schooling opportunities. As would be expected, the ratio of female to male students enrolled at the primary and secondary levels is much lower for the socially disadvantaged groups, like Scheduled Tribes, Scheduled Castes and Other Backward Castes, than for the mainstream social groups (e.g., forward castes) (Figure V.11). However, the pattern across economic groups is unexpected. The bottom consumption quintile has the highest ratio of female to male students among all consumption quintiles, while the second quintile has the lowest ratio (Figure V.11). The differences across the top three quintiles are relatively small.

Gender disparity in schooling opportunities for children has a predictable pattern across adult schooling levels in the household. The ratio of female to male students is greater in households where the highest-educated male or female has some schooling (as opposed to

Figure V.11 : Ratio of girls to boys in primary and secondary schools (%), by social group and consumtion quintile, 1999-2000

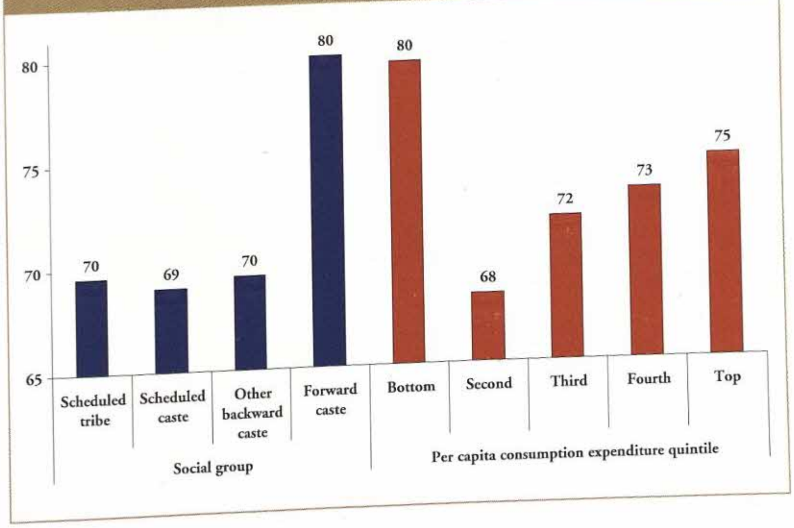
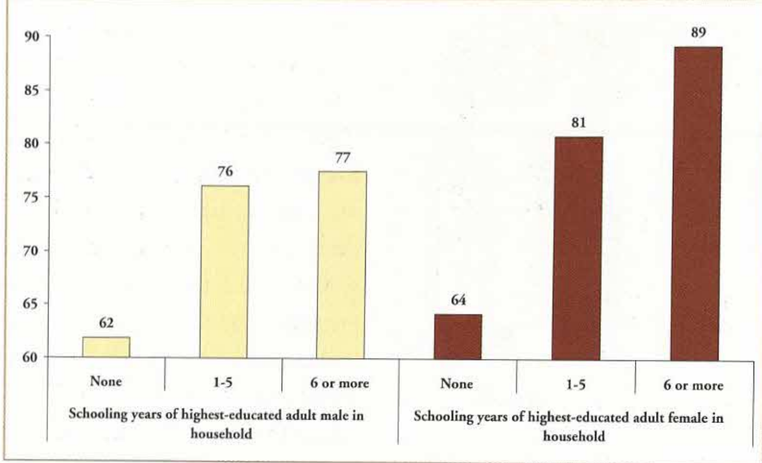


Figure V.12 : Ratio of girls to boys in primary and secondary schools (%), by adult male and female schooling in households, 1999-2000



no schooling) (Figure V.12). The data also seem to suggest that the relative position of girls improves to a larger extent with adult *female* schooling in the household than with adult *male* schooling. For instance, in households where the highest-schooled adult female has 6 or more years of schooling, the ratio of female to male students is 89%; in contrast, in households where the highest-schooled adult male has 6 or more years of schooling, the ratio is only 77%.

Infrastructure and Gender Disparity

The NSS data also suggest that access to infrastructure is associated with lower levels of gender disparity in schooling. For instance, in districts where more than three-quarters of the population has access to electricity, the ratio of female to male students is 80%, while in those districts where electricity coverage is 25% or less, the ratio is only 61% (Figure V.13).

Likewise, better access to roads is also associated with lower levels of gender disparity, although the difference in the ratio of female to male students across districts with poor and good road infrastructure is not as large as that between districts with poor and good electricity coverage (Figure V.13).

How does gender disparity in enrollments vary with school infrastructure? The data do not show any relationship between the ratio of female to male students in primary and secondary schools on the one hand and the number of primary and secondary schools per 1,000 children aged 6-18 on the other (Figure V.14). However, a clear relationship is observed between government expenditure on elementary and secondary education per child aged 6-18 and the ratio of female to male students (Figure V.14). In states where per-child public spending is less than Rs. 1,000 per annum, the ratio of female to male students is 65%. The ratio increases consistently with greater spending, and reaches a level of 83% in states which spend Rs. 2,000 or more per annum on elementary and secondary education per child 6-18.

Multivariate Analysis of Gender Disparity

To examine the likelihood of the various states in India attaining the gender disparity MD goal, we have estimated a

Figure V.13 : Ratio of girls to boys in primary and secondary schools (%), by infrastructure availability, 1999-2000

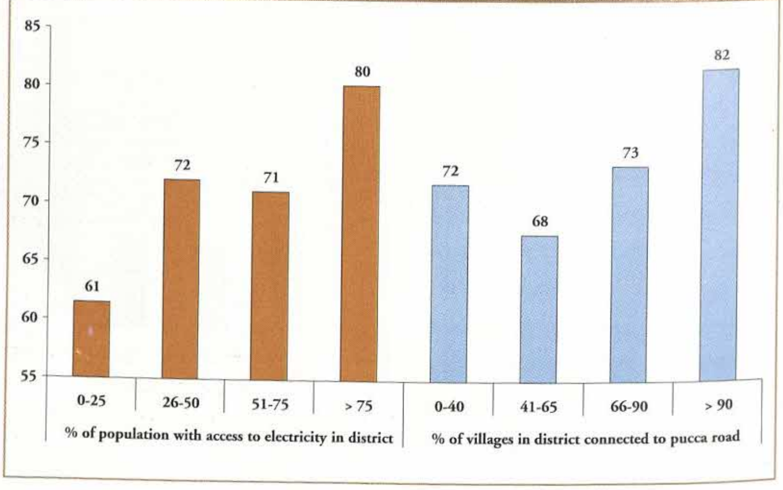
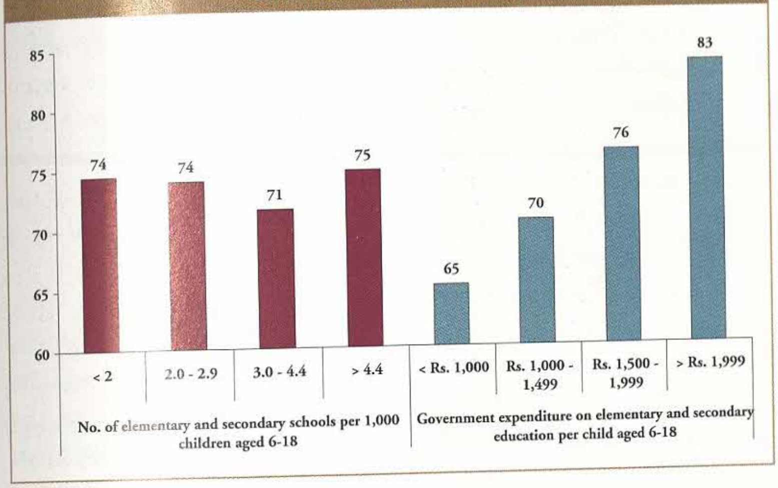


Figure V.14 : Ratio of girls to boys in primary and secondary schools (%), by school availability and by government expenditure on education, 1999-2000



multivariate model of school attendance separately for boys and girls aged 6-18 years, using the NSS 55th round unit record data (at the child level).[86] The multivariate model has the advantage of controlling for several variables that may be simultaneously associated with child schooling. The estimation results are reported in Annex Table 6, while only the key findings of the empirical analysis are discussed here.

The multivariate model indicates a significant positive association between household living standards (as measured by household consumption expenditure per capita) and school attendance, with the association being significantly smaller for girls than for boys.[87] Controlling for household living standards, the level of economic development in a state (as proxied by state per capita GDP) is inversely associated with female school attendance (and has no significant association with male attendance).

Public spending on elementary and secondary education per child aged 6-18 years is significantly (positively) associated with school attendance, but there is no significant difference in this association across males and females. Surprisingly, however, the *composition of public spending* across schooling levels is associated with gender disparity, with a higher share of secondary schooling in total public spending on education being associated with a higher ratio of female to male enrollment.[88] Such a finding would be consistent with additional public spending *on secondary education* drawing more girls than boys into school, at least in comparison to additional public spending on primary education.

The results also indicate that access to electricity is associated with a reduction of gender disparity, since it has a stronger association with female than male school attendance.[89] On the other hand, access to roads has a smaller association with female attendance, probably reflecting the fact that, even if roads are available, parents are less likely to send their daughters to schools far away from their village of residence.[90]

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[86] AA single equation with separate intercept and slope female dummy variables was estimated. Since the dependent variable is a dichotomous variable (i.e., whether or not a child is in school), the model has been estimated by the maximum-likelihood probit method.

[87] These results do not necessarily contradict those reported in Section B of this chapter. There, it was observed that increases in state per capita income were associated with an increased ratio of females to males in *primary* school. Since there was no control for other variables, such as maternal schooling, the positive association could have reflected the fact that higher income levels are associated with improved maternal schooling, which in turn is strongly associated with higher female relative to male child enrollments. The household analysis undertaken here controls for other variables. In addition, the dependent variable in this analysis is enrollment at the *primary and secondary* levels (not just the primary level, as was the case in Section B).

[88] As an alternative, a state fixed-effects model was estimated, in which a full set of state dummy variables replaced the six state-level variables (viz., log of gross state domestic product per capita, log of state government elementary and secondary expenditure per child 6-18, the ratio of government expenditure on secondary schooling to that on elementary and secondary schooling, and interactions of these three variables with sex of a child). Although the state dummy variables were significant as a whole at the 5% level, the explanatory power of the regression, as measured by a pseudo R-squared measure, did not change at all with the substitution of the state dummy variables for the state-level variables (the pseudo R-squared measure remained at 0.27). This suggests that the state fixed effects model is not superior to the model reported here in terms of goodness-of-fit.

The findings on the association between adult male and female schooling on the one hand and male and female school attendance on the other hand are of interest. While there is no significant gender difference in the association between adult male schooling in a household and child school attendance, a gender difference is observed for adult female schooling. The latter clearly has a much stronger (positive) association with female than with male school attendance in the household. These results add to the significant amount of evidence from around the world that adult female schooling improves the relative position of girls within a household.

The results also show that the number of elementary and secondary school per 1,000 children aged 6-18 is associated more strongly with female than with male school attendance. Such a finding is consistent with female schooling being relatively more capacity-constrained than male schooling. On the other hand, there is no significant gender differential in the (inverse) association between pupil-teacher ratios and school attendance.

Finally, as would be expected, crime against women (as measured by the number of cognizable kidnappings of women and girls per capita) has a significant, inverse association with the school attendance of females aged 6-18 years.

Simulations

Based on the multivariate analysis reported above, we have undertaken simulations of the school attendance rate for males and females aged 6-18 years in the poor states under different intervention scenarios. The nature and magnitude of these hypothetical interventions are shown in Table V.1. Figure V.15 shows the change in the projected male-female difference in the school attendance rate for 6-18 year olds in the poor states from 1999 to 2015, under the assumption that all of these interventions are pursued simultaneously. The gender gap in the school attendance rate is projected to decline by about 3.6 percentage points (from about 13 percentage points in 1999 to 9.4 percentage points in 2015) — less than a third of the distance to the MD goal of a zero gender gap.

Figure V.15 shows the contribution of each of the proposed interventions to the change in gender disparity from the base year. Improved living standards (proxied by increases in both household and community consumption expenditure per capita) and greater road access are actually associated with *increased* gender disparity in attendance, as both of these variables have a stronger positive association with male than with female attendance. The other five interventions are associated with reduced gender disparity. Gender disparity in school attendance is strongly associated with an expansion of adult female schooling, with each year of adult female schooling being associated with a reduction of 8% in the gender gap in enrollment. An expansion in the share of secondary education in public spending on education and an increase in the number of

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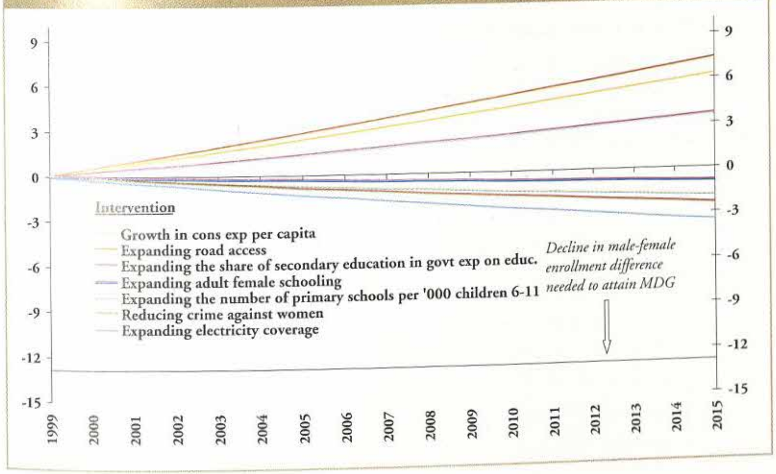
[89] In other words, scarcity of schools in a community is more likely to constrain girls than boys from attending school.

[90] As noted in chapter 4, an econometric study by Chin (2002) for India, using several rounds of the NSS data, concludes that the teacher component of Operation Blackboard — a centrally-sponsored scheme launched in 1987 that provided a second teacher to single-teacher primary schools and a packet of teaching-learning materials to all primary schools — significantly raised primary school completion and literacy rates for girls, but not for boys. Chin's results do not contradict those presented here, since she is concerned with primary completion rates of boys versus girls while we are concerned with the overall enrollment of boys and girls aged 6-18. In addition, Chin analyzes the impact of additional teachers per school, as provided by Operation Blackboard - not the impact of raising the pupil-teacher ratio.

Table V.1: Assumptions about various interventions to reduce gender disparity in primary and secondary school enrollment rate in the poor states, 1999-2000 to 2015

Intervention	Starting value in 1999-2000	Assumed change per year	Ending value in 2015
Adult male schooling (years)	4.5	0.25	8.5
Adult female schooling (years)	2.0	0.3	7.8
Share of secondary education in total government expenditure on education (%)	36	1%	52
Consumption expenditure per capita (Rs.)	409	3%	656
Population coverage of electricity (%)	42.5	1% point	58.5
% of villages in district having access to a *pucca* road (%)	59.5	1% point	76.5
Crime against women (no. of female kidnappings and rapes per 100,000 pop.)	1.65	-0.05	0.85
No. of primary schools per 1,000 children aged 6-11	5.1	0.2	8.3
Pupil teacher ratio in primary schools	91	-1.0	75

Figure V.15 : Projected changes in male-female difference (% age points) in school attendance rate of children aged 6-18 in the poor states, 1999-2015, under different intervention scenarios (graph shows cumulative effect of each additional intervention)



elementary and secondary schools per child aged 6-18 are also associated with appreciable reductions in the gender gap in school attendance.

It is interesting to note that an expansion in the number of schools per 1,000 children is associated not only with a reduction of the gender disparity in school attendance but also with an increase in *overall* school attendance (as discussed in chapter 4). Further, as noted earlier in chapter 4, other evidence from India suggests that, at the margin, the poor benefit more than proportionately from an expansion in overall enrollments, since they are typically the last students to be enrolled (Lanjouw and Ravallion 1999). Thus, investing in additional schools would appear to be an important investment from a number of perspectives. In 2002 alone, the Government of India, under the universal primary schooling initiative, *Sarva Shiksha Abhiyan* (see Box IV.3), had sanctioned an additional 10,700 primary and elementary schools and an additional 62,000 Education Guarantee Scheme centers to be opened around the country (*The Hindu*, August 05, 2002).

One issue that the simulation analysis in unable to highlight is the role of incentives in narrowing gender disparities. Since gender disparities in schooling outcomes are largely caused by parental discrimination against the girl child, public policies that increase the parental incentive to invest in girls, such as tuition waivers for girls and female stipends and scholarships, are likely to work well in narrowing the gender gap. An example of a policy intervention that has worked remarkably well in narrowing gender disparities in secondary school enrollments is the Female Secondary School Stipend program in Bangladesh (see Box V.1). This program seeks to not only increase the enrollment of girls at the secondary level but to also ensure that most of them are retained until graduation from secondary school. Many states in India also subsidize the schooling of girls in various ways.

Finally, it is important to reiterate the message of earlier chapters — viz., a simple expansion of school capacity or introduction of a female scholarship program will not work unless it is accompanied by broad-ranging institutional reform to reduce teacher absenteeism and to make schools and school managers more accountable to students and the community (World Bank 2003). The reform will require, among other things, empowering communities and parents who can hold the state accountable for school performance, decentralizing educational decision-making, giving greater autonomy to schools, involving parents in school management, and motivating front-line workers via a system of incentives and disciplinary action.

Box V.1: Bangladesh Female Secondary School Stipend Program

The attendance of girls relative to boys in secondary schools started to grow at a record rate in Bangladesh after the government decided to exempt fees and give cash incentives to girl students, under the Female Secondary School Stipend (FSSS) program launched by the Government of Bangladesh in 1994, with assistance from the World Bank, Asian Development Bank, and the Government of Norway. (Unlike primary school, which is free, secondary schooling requires payment of tuition fees in Bangladesh. In addition, households have to incur all other costs, such as transportation, books, uniforms, school supplies, and examination fees.) The program has been successful in its twin objectives of increasing the number of girl students entering secondary school as well as keeping them in school until graduation. With this program, Bangladesh has become a pioneer in increasing female secondary enrollments and in narrowing gender disparities at the secondary level among the nations of South Asia.

Although the project was initially implemented in 118 *thanas* in 1994, it was later expanded to all rural *thanas* in the country and converted to a national female secondary stipend program. Under the program, stipends covering full tuition, examination costs, and an increasing proportion of school fees, textbooks, school supplies, uniforms, shoes, transport and kerosene (for lamps) are available to girls as they progress from Grades 6 to 10. The coverage of other costs rises with grade because extra incentives are needed in the upper grades to reduce high dropout rates.

The project is also simultaneously increasing the number of teachers — especially female teachers — in secondary school; providing occupational skills training to girls who are about to graduate; making schools more attractive to provide a healthier and safer setting for girls; and strengthening government institutions for secondary education.

Hunger Poverty

While the debate on poverty in India goes back several decades, it has focused almost exclusively on changes in the 'headcount' ratio of consumption poverty — viz., the proportion of the population having monthly per capita consumption expenditure that is lower than the poverty line. In this report, we focus on hunger-poverty as measured by calorie deficiency — the inability to consume the energy (calories) required by the body. We use NSS consumption survey data from the 50th and 55th rounds to calculate mean daily calorie intake per person, using food-to-calorie conversion factors obtained from Gopalan et al. (2003) and NSSO (1996b, 2001b). The calculation of calorie norms or requirements is much more complicated, and has been the subject of a contentious debate. For instance, the average calorie norm of 2,110 calories per capita per day prescribed by the FAO for South Asia (FAO 1996) is much lower than the 2,400 calorie norm that has been typically used in India (Meenakshi and Vishwanathan 2003). We have used the normative age-specific calorie requirements recommended by the Planning Commission Task Force (GOI 1979), but with additional adjustments for heavy, moderate and sedentary work for individuals aged 19 years and older based on their occupations and operations (tasks performed). Operational and occupational data were obtained from the employment modules of the NSS 50th and 55th rounds (see Dubey 2002).

The MDGs call for a halving of hunger-poverty between 1990 and 2015. For India, this would mean bringing down the headcount ratio of calorie deficiency from 62.2% in 1990 to 31.1% in 2015.[91]

Trends and Patterns

Levels and Trends

Hunger is pervasive in India. In 1999-2000, for instance, more than one-half (53%) of India's population consumed fewer calories than it required. This is nearly double the estimated national incidence of *consumption* poverty of 22-26%.[92, 93]

There was, however, a substantial decline in the incidence of hunger-poverty during the 1990s. In 1993-94, as much as 60% of the Indian population did not consume the calories it required. The decline from 60% to 53% by 1999-2000 represents an annual decline of about 2% in the proportion of the population consuming insufficient calories.[94]

Interstate Variations

As with other indicators, there are large interstate variations in the extent of

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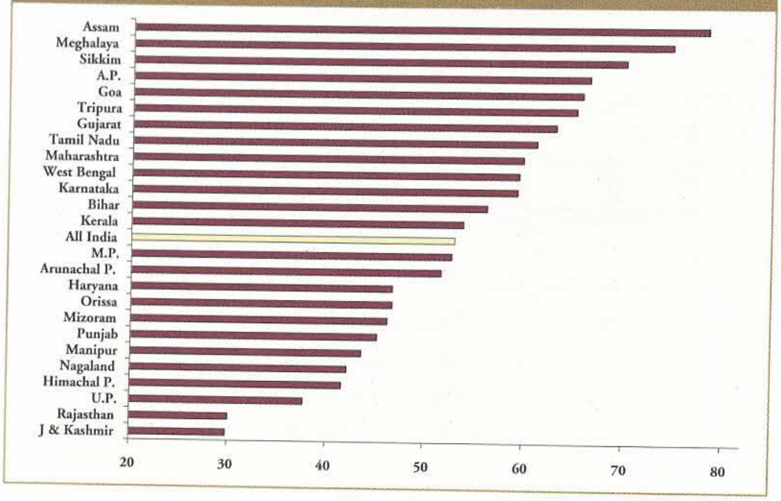
[91] The most reliable estimates are available from the 50th and 55th rounds of the NSS for 1993-94 and 1999-2000, respectively. The rate shown for 1990 is projected from the change observed between 1993-94 and 1999-2000.

[92] The official (Planning Commission) estimate of poverty incidence for 1999-2000 was 26%, while Deaton and Dreze have estimated poverty incidence to be about 22%, using the same 'official' poverty line but different price deflators and adjustments for changes in the expenditure data collection methods introduced in the 55th round of the NSS. See Deaton and Dreze (2002).

[93] Meenakshi and Vishwanathan (2003) also calculate 'headcount' rates of calorie poverty, but use fixed calorie norms of 1800, 2200 and 2400 calories per person per day.

[94] According to official Planning Commission estimates, the headcount ratio of consumption poverty declined from about 36% to 26% over the same period. However, using an alternative methodology, Deaton and Dreze report the decline to be from 29% to 22% (Deaton and Dreze 2002). Thus, the annual rate of decline in consumption poverty was much greater (4.7 to 5.5%) than that in hunger-poverty.

Figure VI.1 : Percent of population that is calorie-deficient, by state, 1999-2000



hunger-poverty (Figure VI.1). Assam tops the list, with a staggering 78% of the population being calorie deficient, followed by many of the other Northeastern states. Goa and Andhra Pradesh also rank among the five states having the largest proportion of calorie-deficient population. At the other extreme, Jammu & Kashmir, Rajasthan, and Uttar Pradesh have the lowest rate of calorie deficiency (30-38%).

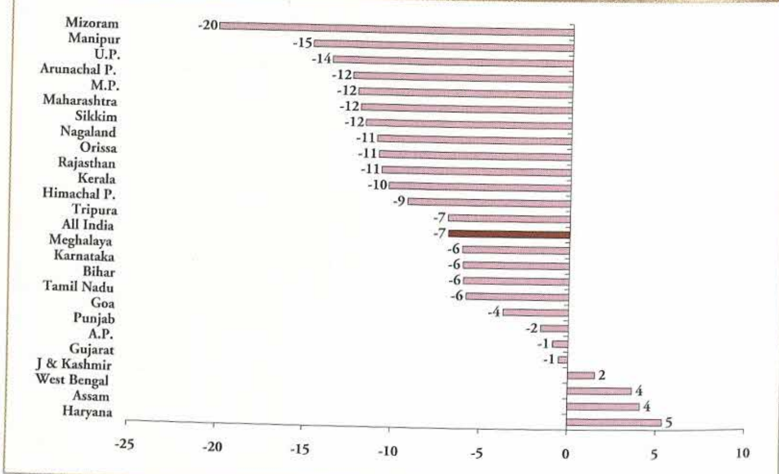
These numbers underscore the difference between the concepts of consumption- and hunger-poverty. Some of the states that rank low on consumption poverty, like Gujarat, rank high on hunger-poverty, while states that rank high on consumption poverty, like Uttar Pradesh, have low levels of hunger-poverty. This suggests that reduction of (consumption) poverty is not synonymous with eradication of hunger or an improvement in food security. The latter may depend upon such factors as local availability of food, agricultural productivity, and food tastes and preferences of the population.[95]

The rate at which hunger-poverty declined during the 1990s also varies significantly across states (Figure VI.2). Uttar Pradesh as well as many of the Northeastern states, such as Mizoram, Manipur, Arunachal Pradesh, and Nagaland, experienced large declines (greater than 10%) in hunger-poverty between 1993-94 and 1999-2000, while four states — Haryana, Assam, West Bengal and Jammu & Kashmir — actually experienced an increase in the incidence of hunger.

Intra-State Differences

Even within states, there are large differences in the incidence of calorie deficiency. For instance, Annex Table 9 shows that the incidence of hunger-poverty in 1999-2000 varied from 48% to 75% even within the state of Gujarat. Surprisingly, the lowest rate of hunger-poverty in that state was found in the arid areas of the state, while the highest rate was in the southern plains. As many as 8 out of a total of 78 regions in the country had 70% or more of their population consuming insufficient calories.

Figure VI.2 : Percent change in the proportion of population that was calorie-deficient, 1993-94 to 1999-2000, by state



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[95] See Behrman and Deolalikar (1988) for a discussion of these concepts.

Annex Table 9 also reports regional data on the incidence of hunger-poverty for an earlier year (1993-94). The table shows wide variation in the performance of different regions in reducing calorie deficiency. A few regions in states as varied as Uttar Pradesh, Maharashtra and Rajasthan were able to reduce the incidence of calorie deficiency by more than 40% during those six years. At the other extreme, four regions experienced an increase of more than 25% in calorie deficiency over the same period.

Figure VI.3 : Socio-economic differences in calorie deficiency, 1999-2000

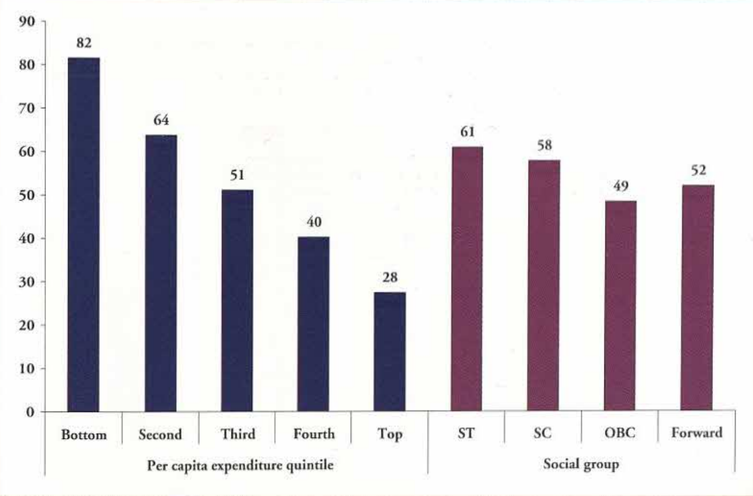
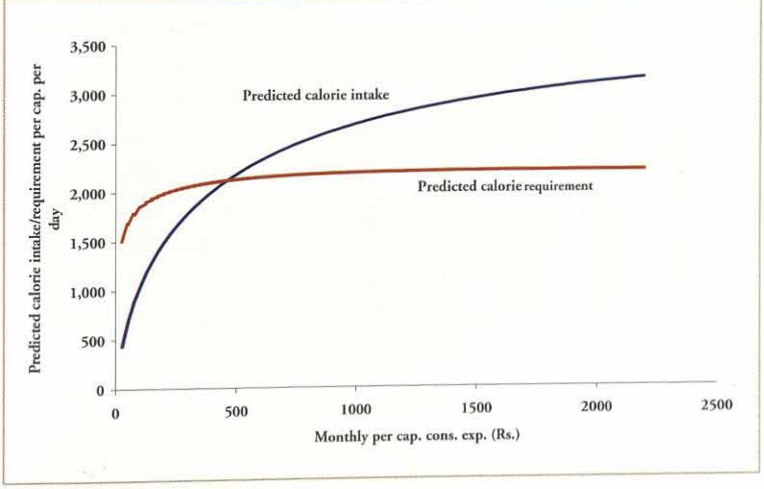


Figure VI.4 : Predicted calorie intake and requirements per capita per day, 1999-2000



Socio-economic Variations in Calorie Deficiency

There are predictable differences in the incidence of calorie deficiency across economic groups (Figure VI.3). An overwhelming 82% of the bottom consumption quintile is calorie-deficient, as compared to only 28% of the top consumption quintile. However, the differences in calorie deficiency across social groups are significantly smaller. While STs have slightly larger share of calorie deficiency than SCs and OBCs, the differences are modest. In addition, forward castes appear to have a higher rate of calorie deficiency than Other Backward Castes.

Figure VI.4 shows the relationship between living standards, predicted calorie intake and predicted calorie requirements.[96] At low levels of monthly consumption expenditure per capita (Rs. 450 or lower), predicted calorie requirements exceed calorie intakes, resulting in high levels of calorie deficiency. With increasing income, predicted calorie intakes increase rapidly — more rapidly than predicted calorie requirements — and this progressively lowers the predicted risk of hunger-poverty. Figure VI.4 also shows that predicted calorie requirements are relatively low (but not lower than predicted calorie intake) for the very poor, but plateau rather early at about 2,100-2,200 calories per person per day.

The NSS data also show a strong association between adult schooling levels and calorie

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[96] Both calorie requirements and intake have been predicted on the basis of a regression that includes the log of monthly per capita consumption expenditure and its squared term.

Figure VI.5 : Percentage of population that is calorie deficient, by adult male and female schooling in household, 1999-2000

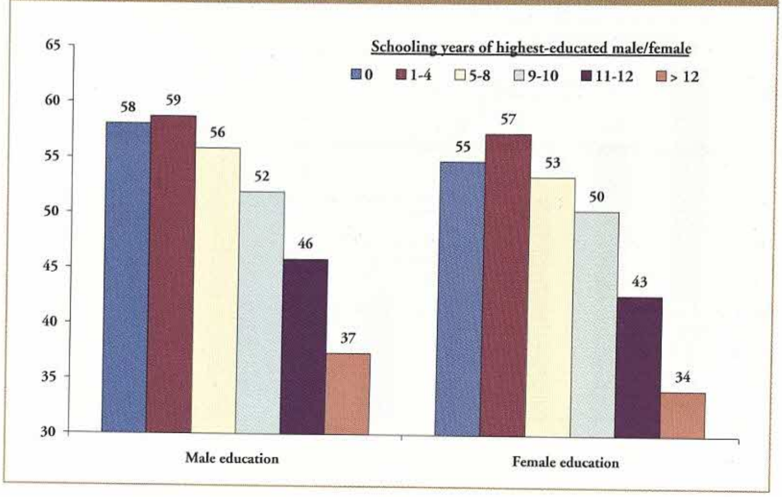


Figure VI.6 : Percentage of population that is calorie deficient, by infrastructure access, 1999-2000

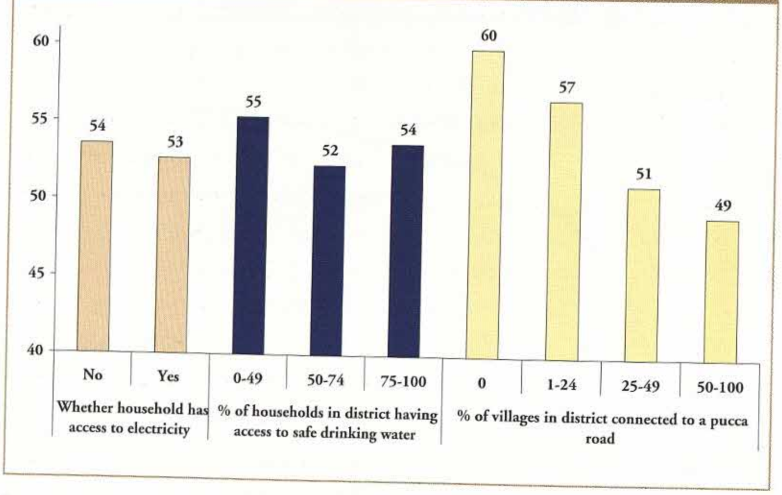
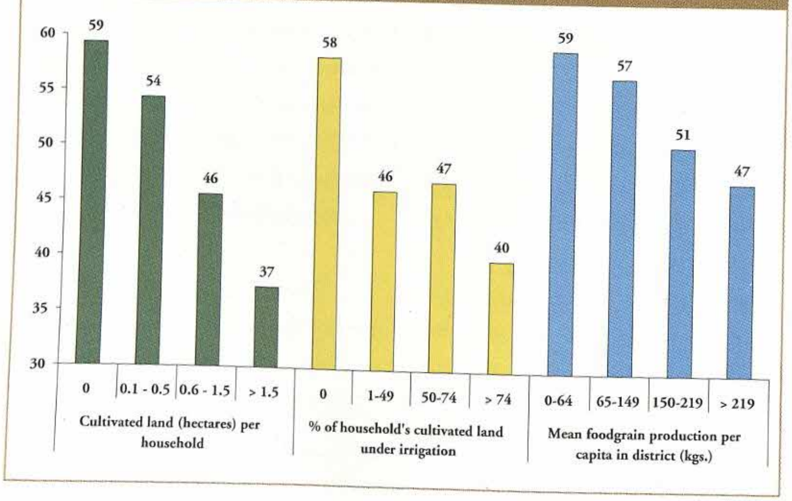


Figure VI.7 : Percentage of population that is calorie deficient, by various agricultural indicators, 1999-2000



deficiency (Figure VI.5). Individuals in households where the highest-educated adult male or female has fewer than five years of schooling have the highest risk of calorie deficiency (57-59%). The risk declines rapidly with more schooling. No significant gender differences in the association between schooling and hunger-poverty are observed.

Role of Infrastructure

Surprisingly, the data do not show much of an association between hunger-poverty and electricity access (Figure VI.6). Access to safe drinking water is also not observed to have a strong association with calorie deficiency. But better village access to *pucca* (sealed) roads is associated with lower rates of calorie deficiency. In districts where 75-100% of villages are connected by *pucca* road, the incidence of hunger-poverty is 49%, as compared to a level of 60% in districts where none of the villages are connected.

Figure VI.7 shows the incidence of calorie deficiency by various agricultural indicators. As would be expected, the risk of hunger-poverty declines significantly with farm size; individuals residing in households cultivating 1.5 hectares or more of land have calorie deficiency rates that are only about two-thirds of those for individuals residing in households with no land. In addition, access of a household to *irrigated* land and food availability in a district are associated with a reduction in the risk of calorie deficiency substantially. For instance, the incidence of calorie deficiency is as high as 58% in households with no irrigated land, while it is significantly lower — 40% — among households having 75% or more of their cultivated land under irrigation. Likewise, in districts where the mean production of food grains per capita is 220 kilograms or more, the risk of hunger-poverty is 47%, while it is 59% in districts producing less than 65 kilograms of food grains per capita.

It is not surprising that food security is achieved, and the risk of hunger reduced among households with access to land (particularly, irrigated land) and in regions with greater food availability. Even though most restrictions on the inter-state movement of food grains in India have been removed for some time and intra-national trade in food grains is growing, fragmented product markets and poor grain storage and transportation facilities mean that areas with low agricultural potential and households with no access to land often have less access to food and thus are more vulnerable to hunger and malnutrition.

Multivariate Analysis of Calorie Deficiency

To examine the likelihood of the various states in India attaining the hunger-poverty MD goal, we have estimated a multivariate model of calorie deficiency, using the NSS 55th round unit record data (at the household level). The multivariate model controls for several variables that may be simultaneously associated with calorie deficiency.[97] The estimation results are reported in Annex Table 7, while only the key findings of the empirical analysis are discussed here.

The multivariate model confirms many of the observations drawn from the graphs presented above. Schooling years of the highest-educated adult male and female in a household are strongly (inversely) associated with the risk of hunger-poverty. Female-headed households are less likely to be calorie deficient than male-headed households. Rural households and farm households are less likely to be calorie deficient than urban and non-farm households, respectively, reflecting the importance of land in reducing vulnerability. In the same vein, the results show that agricultural labor households, who are typically landless, are more likely than other households to be calorie deficient.

The results with respect to social groups are somewhat unusual. Scheduled Tribes are at significantly greater risk of hunger-poverty than forward castes, but Scheduled Castes and Other Backward Castes have a lower risk of calorie deficiency. Similarly, Muslims are more likely than non-Muslims to be calorie deficient, but Sikhs are less likely to be so.

The results do not show a significant association between access to electricity and calorie deficiency, either for the poor or the non-poor states. However, access to safe drinking water is associated with a reduced risk of calorie deficiency, but only in the poor states. Access to *pucca* roads is strongly inversely associated with hunger-poverty in both poor and non-poor states, but the association is nearly two times as strong in the poor as in the non-poor states.

The results confirm the importance of access to land and availability of food in reducing the risk of calorie deficiency. Availability of food in a district, as proxied by the production of food grains per capita, is associated with a decline in calorie deficiency, with the association being three times as strong in the poor states as in the non-poor states. Household access to land, particularly irrigated land, also figures as an important factor in reducing the risk of calorie deficiency. The results further show the association between of calorie deficiency and irrigation being significantly stronger in the poor states than in the non-poor states. All of these results suggest that, even after controlling for other factors, access to the means of food production is associated with a lower risk of hunger and calorie deficiency for individuals and households.

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[97] Since the dependent variable is a dichotomous variable (i.e., whether or not a household is calorie-deprived), the model has been estimated by the maximum-likelihood probit method.

Because of the strong dependence of household calorie intake (and hence calorie deficiency) on total household consumption expenditure — in large part, a result of food consumption being included in the calculation of total consumption expenditure — we have chosen to include the district-level mean of log monthly consumption expenditure per capita (instead of household consumption expenditure) as an independent variable in the household calorie deficiency model.[98] This variable will reflect a general improvement in community living standards — in other words, economic growth.

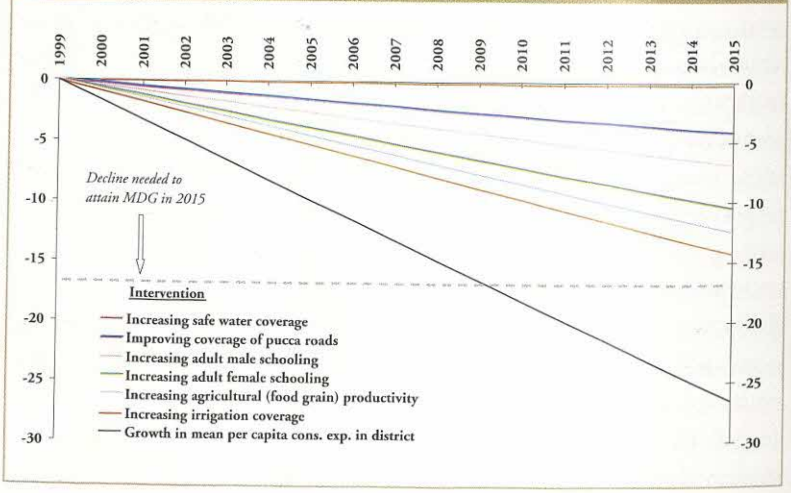
The empirical results indicate a strong and significant association between living standards and calorie deficiency, with a one percent increase in mean district per capita expenditure being associated with a reduction in hunger-poverty of 0.26%. These results are consistent with the estimated income (more precisely, total expenditure) elasticity of calorie intake of 0.3-0.5 for Maharashtra obtained by Subramanian and Deaton (1996) but not with the near-zero elasticity estimates for rural, semi-arid South India by Behrman and Deolalikar (1987).[99] (It should be noted, however, that while the two referenced studies estimate the relationship between calorie intake and total consumption expenditure, this report estimates the association between the probability of a household being calorie deficient and total consumption expenditure.)

Simulations

Based on the multivariate analysis reported above, we have projected the incidence of calorie deficiency in the poor states of the country under different intervention scenarios. The nature and magnitude of these hypothetical interventions are shown in Table VI.1. Figure VI.8 shows the projected decline in calorie deficiency in the poor states from 1999 to 2015, under the assumption that all of these interventions are pursued simultaneously. The incidence of calorie deficiency is projected to decline by about 14 percentage points (47% to 33%) from 1999

Figure VI.8 : Projected changes in the incidence of calorie deficiency (%) in the poor states from 1999 to 2015, under different intervention scenarios

(Graph shows cumulative effect of each additional intervention)



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[98] Another way to address this methodological problem would be to include an instrumental variable for household consumption expenditure per capita in the probit model. However, since the ultimate objective of the analysis is to measure the association between living standard improvements and reductions in calorie deficiency, the inclusion of district-level means of consumption expenditure per capita in the regression is a simpler alternative.

[99] The elasticities estimated by Subramanian and Deaton (1996) are not directly comparable to those estimated by Behrman and Deolalikar (1987) because of differences in the (i) data sets used (Maharashtra cross-section versus longitudinal data from six semi-arid villages in south India), (ii) construction of the calorie variable (Subramanian and Deaton use household consumption data from the NSS, while Behrman and Deolalikar use direct food intake data collected at the individual level), and (iii) estimators (Subramanian and Deaton use a semi-parametric method while Behrman and Deolalikar use a household fixed-effects estimator).

Table VI.1: Assumptions about various interventions to reduce the headcount ratio of calorie deficiency in the poor states, 1999-2000 to 2015

Intervention	Starting value in 1999-2000	Assumed change per year	Ending value in 2015
Adult male schooling (years)	4.5	0.25	8.5
Adult female schooling (years)	2.0	0.3	7.8
% of households in district with access to safe drinking water	77.3	1% point	93.3
Mean consumption expenditure per capita (Rs.) in district	409	3%	656
% of villages in district having access to *pucca* road	59.5	1% point	76.5
Food grain production per capita in district (kgs.)	186	2%	255
% of cultivated area of household that is irrigated	29.2	1% point	45.2

to 2015 with six of the seven interventions — just slightly less than the 17 percentage points' decline that would be needed to attain the MD goal (for the poor states). However, the seventh intervention — viz., general economic growth resulting in a 3% annual rise in mean district consumption expenditure per capita — is associated with a further reduction of 12 percentage points in the calorie deficiency rate.

Figure VI.8 also shows the relative contributions of each of the proposed interventions to the reduction of hunger-poverty. As noted earlier, the largest reduction in hunger-poverty is observed to come with improved living standards (economic growth), followed by improved road access and female schooling. Indeed, economic growth alone contributes nearly as much to the decline in hunger-poverty as the remaining six interventions combined — a result that is consistent with the strong association between economic growth and poverty reduction observed by other studies (e.g., Dollar and Kray 2000). Male schooling, irrigation, and food grain availability have somewhat smaller, albeit still significant, associations with the reduction of hunger-poverty. Together, the seven interventions considered will easily allow the hunger-poverty MDG to be attained by 2015, even in the poor states of the country.

Conclusion

There are several major findings and implications for policy that come out of this report. **First,** there are very large disparities across different states and regions of India in terms of their performance on the millennium development indicators. As would be expected, the levels of the indicators are much worse in the Northern states — Bihar, Uttar Pradesh, Orissa, Rajasthan, and Madhya Pradesh — than in the Southern and Western states. However, when it comes to changes in the indicators *over time,* there are several surprises. For instance, over the 20 years between 1981 and 2000, Bihar managed to reduce its infant mortality rate at a much faster rate than Karnataka or Andhra Pradesh. Likewise, between 1992-93 and 1998-99, child underweight rates declined at a faster pace in Uttar Pradesh and Bihar than in Gujarat, Maharashtra or Kerala.

Not surprisingly, given the large size and heterogeneity of most Indian states, the state averages of the MD indicators mask large intra-state variations. For example, in some states — even those such as Kerala — the infant mortality rate in the high-mortality regions is two times as large as that in the low-mortality regions. The net primary enrollment rate in Madhya Pradesh varies from 29% in one region (Malwa) to 62% in another (South Madhya Pradesh). Intra-state disparities in the change of the MD indicators over time are even greater. For instance, one region within Madhya Pradesh experienced a decline of 22% in the proportion of underweight children between 1992-93 and 1998-99, while another region saw that rate increase by 11% over the same period.

While we have individually identified the regions in the country having the lowest score on each of the five MD indicators analyzed in this report,[100] it may be useful to identify the regions that rank poorly on *all* of the five indicators. Such regions could be considered the most deprived regions in the country. Annex Table 10 shows the regions that fall in the lowest quartile (25%) based on their individual rankings on three or more of the MD indicators. The table shows that there are 18 regions in the country that rank consistently low on three or more indicators. Of these, 8 regions rank very low on four or more indicators. But there are only two regions in the country that consistently rank in the lowest quartile of regions on *all five MD indicators* considered in this report. These regions are the South-Western region of Madhya Pradesh and the Southern region of Rajasthan.

Obviously, the large inter- and intra-state variations have important implications for the targeting of interventions and resources to the lagging states and regions. But they also have another important implication — the need for state-specific approaches that allow for greater flexibility in addressing problems. What works in a state such as Tamil Nadu may not work well in another state, such as Orissa. Even though health and education are state-level subjects in India, the central government plays a strategic role in these sectors via its centrally sponsored schemes. In the case of health, for instance, centrally - sponsored schemes account for a large portion of the public health and reproductive health activities undertaken in a state. Likewise in the education sector, centrally sponsored schemes, such as Operation Blackboard, finance a significant portion of non-salary costs of education in the states. It will thus be important to make centrally-sponsored schemes more flexible and more responsive to local conditions.

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[100] These indicators are: infant mortality, child underweight rate, net primary enrollment rate, primary completion rate, gender disparity in enrollment among 6-18 year olds, and calorie-deficiency rate.

A second and related finding of this report is that many of the millennium development indicators have high levels of geographical concentration in India. For instance, one-fifth of the villages and districts account for about one-half of all the infant deaths and underweight children in the country. Amazingly, three-quarters of all the out-of-school children aged 6-11 years are concentrated in only 20% of the country's villages. These findings lead to several interesting and policy-relevant questions, such as: Are the villages that account for the large majority of infant deaths in the country also the ones that account for the large numbers of out-of-school children? Where are these villages located? What are the characteristics of these villages that contribute to their poor social indicators? Unfortunately, currently-available data cannot shed light on these important questions, because the sample surveys on the basis of which these observations are made are not large or representative enough at the village level. However, promising new methodologies, based on merging of household survey and population census data, are available for identifying specific villages having the worst human development outcomes. It would be worthwhile to explore the use of such methodologies to identify the villages with the worst MD indicators in the country, so that policy interventions could be better targeted to these villages.

The results on geographical concentration of the MD indicators suggest that targeting resources and interventions to villages and districts with the worst human development indicators is not only desirable for improving equity, but will also be the most effective strategy for attainment of the MDGs. How best to achieve this targeting is an issue that would appear to merit priority attention.

Third, there are other types of disparities in most of the MD indicators, the reduction of which would help in the attainment of the MDGs. Gender disparity is one example. It is estimated that overall child mortality in the country would drop by 20% if girls had the same mortality rate as boys between the ages of 1 month and 5 years. Likewise, the overall school enrollment rate for children aged 6-11 years would increase by about 7% if girls of these ages had the same enrollment rate as boys. Among older children, the equivalent increase in enrollment rates would be even greater (about 10% for 12-14 year olds and 16% among children 15-18 years of age). Just as geographical targeting is likely to narrow regional disparities, targeting by gender can help reduce gender inequalities. Since gender disparities in health and schooling outcomes are largely caused by parental discrimination against the girl child, public policies that increase the parental incentive to invest in girls, such as female scholarships or health-care subsidies for girls, are likely to work well in narrowing the gender gap. (Many states in India already subsidize the schooling of girls in various ways, although gender-targeted subsidies for health-care and nutrition are much less common.) Many empirical studies from around the world, including some evidence presented in this report, suggest that gender disparities in the health, schooling, and nutritional outcomes of children tend to narrow with mother's schooling, as mothers (relative to fathers) tend to invest more in their female children.[101]

Another manifestation of disparity in human development outcomes is along caste and tribal lines. Scheduled Tribes and, in many cases, Scheduled Castes have significantly higher levels of infant mortality and child malnutrition and significantly lower levels of schooling indicators than mainstream groups. For instance, infant mortality among Scheduled Tribes in the poor states is 60% greater than among other population groups after controlling for living standards, adult schooling, and other characteristics. Given that these groups constitute between one-quarter and one-third of the total population of the poor states in the country, improving their MD indicators would help significantly in the attainment of the MDGs in these states. It is likely that many of the villages identified in this report as having the heaviest concentration of infant deaths and underweight and out-of-school children are, in fact, Scheduled Tribe/Caste villages. If so, targeted interventions to these villages would achieve the dual objectives of reducing geographical as well as caste disparities. For several decades, India has had an extensive system of quotas and reservations for Scheduled Castes and Tribes in employment and higher education opportunities, but the results in this report suggest that targeting maternal and child health, child nutrition, and primary schooling interventions to Scheduled Castes and Tribes is equally important.[102]

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[101] This is not always the case, however. For instance, it has been observed that excess female child mortality is even more pronounced among better-schooled women relative to women with no schooling, at least in rural Punjab (Das Gupta 1987).

Fourth, there is evidence of significant synergies among the different MDGs. For instance, a reduction in the proportion of underweight children is strongly associated with a reduction of child mortality. Although maternal mortality is an MD indicator that has not been analyzed in this report, it is clear that interventions that reduce maternal mortality, such as tetanus immunization, expansion of antenatal care coverage, and an increase in the ratio of professionally-attended deliveries, will also bring about large reductions in infant (especially neonatal) mortality. Likewise, reducing child malnutrition is likely to result in both schooling quantity and quality, as better nourished children are more likely to attend school and perform better in school. Thus there are synergies amongst the MDGs that will help in their attainment, which implies that proceeding with simultaneous action on all these measures will have the greatest impact on attainment of the MDGs.

Fifth, despite appreciable improvement in many of the millennium development indicators during the 1990s, the analysis in this report suggests that attainment of the MDGs (at least the five specific goals considered in this report) will remain extremely challenging in the poor states of India. Yet attainment of the MDGs by the poor states — most notably, Bihar, Uttar Pradesh, Madhya Pradesh, Orissa, and Rajasthan — is critical to MDG attainment by the country as a whole, because these states currently account for a disproportionately large proportion of the country's population (and will account for an even larger population share by 2015 owing to more rapid population growth).

Despite the grim situation, the poor states should be able to meet the MDGs relating to infant mortality, child malnutrition, and hunger-poverty with a combination of interventions, including sector-specific interventions (such as nutrition supplementation and immunization), economic growth, improved coverage of infrastructure, and wide-ranging reforms in the institutions of service delivery. However, the education goals will require considerably more effort. This report concludes that while it will be possible for the poor states to enroll virtually all the children aged 6-11 years in school by 2015, it will be very difficult for them to attain the education-related MDGs of universal primary enrollment and 100% primary completion even with a combination of interventions. In addition, complete elimination of the gender gap in primary and secondary enrollment, called for by the MDGs, will also be a very challenging goal to attain.

The difficulty with the attainment of the education-related MDGs reflects the large discrepancy between the education goals and the current status of the education indicators in the poor states of the country. The net primary enrollment rate in the poor states was only about 50% in 1999-2000. To attain universal net primary enrollment, the poor states in the country would have to double the net primary enrollment rate by 2015. Likewise, the net primary completion rate, which was only 54% in 1999-2000 in the poor states, would have to increase by 85% in order to achieve universal primary completion by 2015.

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[102] Most state governments in India do offer incentives, such as free textbooks and uniforms, to primary school-aged children belonging to scheduled castes and tribes.

Sixth, the simulations carried out in this report indicate that, in the poor states, economic growth that brings about an improvement in household living standards is strongly associated with virtually every MD indicator. For example, real economic growth of 3% per annum in the poor states could alone bring down the child underweight rate from 51% in 1999 to 37% in 2015. This is nearly two-thirds of the total decline in the child underweight rate needed to be attained between 1999 and 2015 to meet the nutrition MDG. Likewise, 3% annual growth could bring about an increase in the net primary enrollment rate from 50% in 1999 to 74% in 2015 in the poor states — about one-half of the total increase in the net primary enrollment rate needed to be attained between 1999 and 2015 to meet the schooling-related MDG. Another example of the important role of economic growth on MDG attainment is provided by the estimates that suggest that a real growth rate of 3% would be associated with a 12 percentage point decline in the calorie deficiency rate — nearly three-quarters of the total decline in the calorie deficiency rate needed to be attained between 1999 and 2015. In other words, rapid economic growth could make a very significant contribution to an improvement in MD indicators between now and 2015.

In spite of the strong associations between improvements in MD indicators and economic growth in the poor states, the latter have actually experienced anemic growth over the last two decades. Bihar's real GSDP per capita has grown at less than 1% per annum between 1980 and 1999, while Orissa and Uttar Pradesh have seen annual real growth rates of about 2% or less. In contrast, states such as Maharashtra, Gujarat, and Karnataka have seen their economies expand at real per capita rates of 4% or more over the same time period. What these results underscore is the importance of accelerating economic growth in the poor states to speed progress toward the MDGs. It is beyond the scope of this report to discuss the precise mechanisms by which growth in the poor states could be stimulated, but investment in physical and social infrastructure and improved governance would probably rank near the top of the list (World Bank 2003b).

Seventh, this report also indicates the importance of infrastructure in attaining the MDGs. For example, simply bringing the poor states to the (average) levels of road, electricity and sanitation coverage in the non-poor states would be associated with reductions of 6.2 percentage points (or 12%) in the proportion of underweight children and of 13.2 deaths per 1,000 live births (or 18%) in the infant mortality rate. Universal (100%) road, electricity and sanitation coverage in the poor states would be associated with reductions of 40% in the child underweight rate and of 60% in the infant mortality rate. The estimated associations between physical infrastructure and schooling outcomes are generally smaller, but the results still suggest that universal electrification in the poor states would be associated with increases of 7 percentage point in the school attendance rate (for 6-11 year olds), 5 percentage points in the net primary enrollment rate, and 5 percentage points in the primary completion rate. All of these associations are most likely underestimated, since they control for gross state domestic product per capita in a state. To the extent that infrastructure is positively associated with income per capita, which (as discussed earlier) is also strongly associated with most of the MD indicators, the full effects of infrastructure on MDG attainment are likely to be even larger.

Eighth, consistent with the findings of numerous empirical studies from around the world, this report finds evidence of strong associations between female adult schooling and virtually every MD indicator considered. An additional year of mother's schooling is associated with a reduction of 4% in infant mortality and 3% in child underweight rates and with increases of 1-2% in the net primary enrollment and primary completion rates. In addition, each additional year of adult female schooling is associated with a reduction in the incidence of hunger-poverty by about 1.5% and of gender disparity in school enrollment by as much as 8%.[103]

These results suggest that the large increases in girls' school enrollment that are likely to occur in the coming years (in part due to the Government of India's *Sarva Shiksha Abhiyan* initiative) will fuel major improvements in all of the MD indicators. Of course, given the lag between a girl's attendance in elementary school and the birth of her children (especially since schooling typically delays both age at marriage and age of first birth), increases in female *primary* enrollments may not show their full effects on fertility, child and infant mortality, child nutrition, and child schooling for several years (perhaps, a decade or longer). However, increases in female *secondary* enrollments are likely to show their results much sooner — well before 2015, the MDG reference year.

Ninth, notwithstanding the importance of general interventions, such as economic growth, infrastructure expansion, and female schooling, the analysis in this report suggests that carefully-targeted, sector-specific interventions will also be important in attaining the MDGs. For instance, a package consisting of expanded child and maternal immunization, antenatal care coverage, nutritional supplementation (including promotion of exclusive breast-feeding), and home-based neonatal services (including treatment of pneumonia) is likely to bring about significant reductions in both infant mortality and child malnutrition. Likewise, our results suggest that an expansion in the number of primary schools would improve access and likely raise school and primary school attendance rates among 6-11 year olds, while a lowering of the pupil-teacher ratio at the primary level would raise primary completion rates. These results are consistent with evidence from around the world that expanded school access is typically well-targeted to the poor, since poor students are almost always the last to be enrolled in a community.

Tenth, while this report has identified the key interventions that are likely to speed attainment of the MDGs, especially in the poor states, it has not prioritized these inter-ventions. The reason for this is that prioritization of interventions should in part be based on the cost-effectiveness of these interventions, and the calculation of cost-effectiveness entails detailed knowledge of the costs of each intervention. The latter is not trivial, especially when the interventions span several sectors (education, health, nutrition, rural infrastructure, etc.). However, this is clearly the next step in this research. In order to come up with a detailed road map of attaining the MDGs, it will be essential to undertake the costing of each of the interventions considered and proposed in this report.

Eleventh, none of the interventions discussed in this report are likely to work unless they are simultaneously accompanied by systematic reform of the institutions of service delivery in India. Additional schools are unlikely to increase enrollment or school completion if teachers frequently are absent from school. A package of home-based neonatal services is unlikely to reduce neonatal mortality rates if health workers are not sufficiently motivated to reach out into the community and deliver the package of services to the poor and most-at-risk. The problem of making publicly-provided services work, especially for the poor, has received a great deal of attention in the *World Development Report 2004*. The poor states of India typically have the most serious problems with governance and service delivery in the social (and other) sectors. Better delivery of public services — whether in health, schooling, nutrition, or infrastructure — is a complex and difficult task that entails creation of the right institutions and incentives, including devolving responsibility for service delivery to local governments and communities, contracting out certain types of service delivery to the non-government sector, empowering consumers to demand better services from government health facilities, introducing competition among public providers, and ensuring the motivation of front-line workers.[104]

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[103] Of course, as noted earlier in chapter 2, it is possible that the association between maternal schooling and the MD indicators estimated in this report does not represent causality, since there is no control for unobserved endowments. A study by Behrman and Rosenzweig (2002) finds that a positive significant effect of mother's schooling on child schooling in cross-sectional estimates becomes significantly negative if data on identical twins are used to control for unobserved genetic and family background endowments, perhaps because more-schooled women — holding ability constant — spend more time in the labor force and less in child care.

Finally, the importance of systematically monitoring MD outcomes at disaggregated levels and evaluating the impact of public programs cannot be overemphasized. This report has highlighted the paucity of reliable, district-level data on most MD indicators. The lack of such data makes it virtually impossible to monitor progress toward attainment of the MDGs at lower levels of administration. In addition, despite the fact that much has been spent by the government on public programs such as the Integrated Child Development Services and the District Primary Education Program, these programs have not been subjected to rigorous, independent evaluation. In order to choose the right set of interventions with which to attain the MDGs, it is critical to know which programs have been successful in improving MD indicators and which have not.

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[104] Thus, "... scaling up [interventions to attain the MDGs] will require both a substantial increase in external resources and more effective use of all resources, internal and external. As resources become more productive, the argument for additional resources becomes more persuasive" (World Bank 2003: 1).

Annex Tables

Annex Table 1 : Maximum likelihood probit estimates of the probability of an infant death in the four years preceding the survey, 1994-98

Independent Variable	Parameter	Asym. z-ratio
Mother's age at child's birth	-0.0121	-6.4
Mother's age squared at child's birth	0.0002	5.2
Whether Scheduled Caste*	0.0378	6.8
Whether Scheduled Tribe*	0.0407	5.0
Whether Other Backward Caste*	0.0205	4.6
Whether female child*	-0.0153	-2.8
Whether household has piped water*	-0.0056	-1.3
Whether household has no access to toilet*	0.0132	2.5
Whether index birth was a twin birth*	0.0526	8.2
Birth order of child	0.0023	1.5
Birth order of child x Whether female child*	0.0056	3.6
Whether household has access to electricity*	-0.0218	-4.2
Whether household has access to electricity x Whether electricity supply is irregular in village	0.0096	1.9
Whether household head female*	0.0028	0.4
Whether household head widow/widower*	0.0089	1.3
Household head's schooling years	-0.0015	-4.5
Mother's schooling years	-0.0025	-4.4
Predicted ln monthly consumption expenditure per capita	0.1371	15.5
Ln government expenditure on health & family welfare per capita in state of residence	-0.0282	-2.9
Ln government health/family welfare expenditure per capita in state of residence x Dummy for poor states	0.0038	2.9
Whether village of residence has a sub primary health center*	-0.0031	-0.9
Percent of villages in district of residence that are connected by a *pucca* road	-0.0002	-3.3
Whether mother received any tetanus shot during pregnancy?*	-0.0186	-4.3
Whether medical attention was present at time of child's delivery*	0.0022	0.5
Whether mother received any antenatal care?*	-0.0100	-2.3
Ln gross domestic product per capita in state of residence	0.0200	1.9
Number of observations	17,781	
Chi-squared test	576	
Log likelihood	-3,818	
Pseudo R-squared	0.070	

Notes: Estimation employs unit record data from the second National Family Health Survey, merged with relevant state- and district-level data, and uses information on all infant deaths during the four years preceding the survey. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 2 : Maximum likelihood probit estimates of the probability of a child aged 0-35 months being underweight, 1998-99

Independent Variable	Parameter	Asym. z-ratio
Age in months	**0.0685**	33.9
Age squared (months)	**-0.0014**	-26.2
Whether Scheduled Caste*	**0.0724**	5.1
Whether Scheduled Tribe*	**0.0845**	4.4
Whether Other Backward Caste*	**0.0574**	4.7
Whether female child*	-0.0025	-0.2
Whether household has piped water*	0.0123	1.0
Whether household has no access to toilet*	**0.0746**	4.8
Whether index birth was a twin birth*	**0.1140**	3.8
Birth order of child x Whether female child*	**0.0129**	3.0
Whether household has access to electricity*	**-0.0731**	-5.3
Whether household has access to electricity x Whether electricity supply is irregular in village	**0.0371**	2.8
Whether household head female*	0.0109	0.5
Whether household head widow/widower*	0.0095	0.5
Household head's schooling years	-0.0010	-1.2
Mother's schooling years	**-0.0151**	-10.3
Predicted log monthly consumption expenditure per capita	**-0.0966**	-4.0
Government expenditure on nutrition per child aged 0-6 in state of residence	**-0.0716**	-3.6
Government nutrition expenditure per child in state of residence x Dummy for poor states	**-0.0118**	-2.7
Whether village of residence has a sub primary health center*	0.0090	0.9
Percent of villages in district of residence that are connected by a pucca road	**-0.0015**	-7.6
Whether medical attention was present at time of child's delivery*	**-0.0303**	-2.7
Mother's age	**-0.0227**	-3.7
Mother's age squared	**0.0004**	3.3
Ln government expenditure on health & family welfare per capita in state of residence	-0.0324	-1.0
Ln gross domestic product per capita in state of residence	0.0398	1.3
Number of observations	13,261	
Chi-squared test	3,158	
Log likelihood	-7,613	
Pseudo R-squared	0.172	

Notes: Estimation employs unit record data from the second National Family Health Survey, merged with relevant state- and district-level data. Anthropometric data were obtained for only the last two births to every eligible woman in the sample, and were restricted to children under 3 years of age at the time of the survey. Underweight is defined as weight that is less than minus two standard deviations below the NCHS standards. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 3 : Maximum likelihood probit estimates of the probability of a child aged 0-35 months being underweight, 1992-93

Independent Variable	Parameter	Asym. z-ratio
Age in months	**0.0441**	45.30
Age squared (months)	**-0.0007**	-38.04
Whether Scheduled Caste*	-0.0112	-1.19
Whether Scheduled Tribe*	**-0.0206**	-1.94
Whether female child*	**-0.0229**	-1.75
Birth order of child	**0.0143**	4.80
Birth order of child x Whether female child*	-0.0002	-0.06
Mother's age	**-0.0065**	-7.36
Mother's schooling years	**-0.0111**	-9.90
Whether household head female*	-0.0029	-0.21
Predicted log monthly consumption expenditure per capita	**-0.1201**	-6.88
Whether household has access to electricity*	**-0.0143**	-1.80
Whether household has no access to toilet*	**0.0867**	8.10
Whether household has access to piped water*	**-0.0187**	-2.15
Whether ICDS center in village of residence*	**-0.0498**	-5.50
Whether ICDS center in village of residence* x Whether child female*	**0.0554**	4.35
Observed probability of child being underweight	0.5342	
Number of observations	26,779	
Chi-squared test	3,464	
Log likelihood	-16,767	
Pseudo R-squared	0.094	

Notes: Estimation employs unit record data from the first National Family Health Survey, merged with relevant village-level data. Anthropometric data were obtained for only the last two births to every eligible woman in the sample, and were restricted to children under 3 years of age at the time of the survey. Underweight is defined as weight that is less than minus two standard deviations below the NCHS standards. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 4 : Maximum likelihood probit estimates of school and primary school attendance among 6-11 year old children, 1999-2000

	Probability of child aged 6-11 attending school		Probability of child aged 6-11 attending *primary* school	
Independent Variable	Parameter	Asym. z-ratio	Parameter	Asym. z-ratio
Age dummies:				
Age 7*	**0.081**	13.59	**0.116**	.61
Age 8*	**0.105**	19.20	**0.168**	.53
Age 9*	**0.126**	20.80	**0.219**	.49
Age 10*	**0.106**	19.76	**0.080**	.42
Age 11*	**0.114**	17.82	**-0.110**	-.69
Age and Female interaction dummies:				
Whether female* x Whether aged 6*	**-0.055**	-8.03	**-0.039**	-4.16
Whether female* x Whether aged 7*	**-0.074**	-9.03	**-0.030**	.93
Whether female* x Whether aged 8*	**-0.080**	-10.77	**-0.074**	15
Whether female* x Whether aged 9*	**-0.101**	-9.59	**-0.076**	61
Whether female* x Whether aged 10*	**-0.118**	-15.85	**-0.086**	71
Whether female* x Whether aged 11*	**-0.142**	-12.29	**-0.062**	67
Whether female* Household head's schooling years	**0.004**	5.12	**0.003**	71
Schooling years of head's spouse	0.002	1.41	**-0.007**	57
Schooling years of highest-educated adult male	**0.014**	19.67	**0.010**	0
Schooling years of highest-educated adult female	**0.010**	9.85	**0.004**	2
Whether household head female*	0.000	-0.01	0.077	8
Whether child of head*	**0.092**	9.05	**0.036**	5
Whether rural resident*	**0.013**	2.59	**0.040**	40
Whether farm household*	-0.005	-1.10	0.006	06
Whether agricultural labor household*	**-0.017**	-4.04	**-0.036**	-6.11
Log of monthly per capita consumption expenditure	**0.084**	19.41	**0.036**	6.43
Log of annual government expenditure on elementary education per child 6-14 years	0.008	1.21	**0.026**	2.90
Whether Scheduled Tribe*	**-0.123**	-18.16	**-0.063**	-7.84
Whether Scheduled Caste*	**-0.057**	-11.15	**-0.032**	-5.07
Whether Other Backward Caste*	**-0.043**	-10.13	**-0.020**	-3.72
Whether Muslim*	**-0.067**	-13.18	**-0.032**	-4.99
Whether Christian*	-0.003	-0.19	-0.008	-0.46
Whether Sikh*	**-0.090**	-5.63	**-0.197**	-12.41
Whether female* x Number of cognizable kidnappings of women and girls per 100,000 population in district (1998) (x 1,000)	**-5.687**	-6.93	**-4.433**	-3.39
Percent of villages in district of residence that are connected by a *pucca* road (x 1,000)	-0.085	-1.28	-0.286	-1.23

Annex Table 4 (Contd.) : Maximum likelihood probit estimates of school and primary school attendance among 6-11 year old children, 1999-2000

Probability of child Independent Variable	Probability of child aged 6-11 attending school Parameter	 Asym. z-ratio	aged 6-11 attending *primary* school Parameter	 Asym. z-ratio
Percent of population having access to electricity in district (x 1,000)	**1.188**	16.90	**0.893**	9.19
Number of primary (grades 1-5) schools per 1,000 children aged 6-11 in district (x 1,000)	**10.300**	15.66	**6.681**	8.42
Pupil teacher ratio in primary schools (grades 1-5) in district (x 1,000)	**-0.113**	-3.16	**-0.313**	-7.04
Ln gross domestic product per capita in state of residence	0.241	19.44	**0.284**	16.92
Number of observations	66,603		66,603	
Chi-squared statistic	13,922		5,574	
Log likelihood ratio	-28,286		-43,298	
Pseudo R-squared	0.198		0.061	

Notes: Estimation employs unit record data from the 55th round of the National Sample Survey, merged with relevant district- and state-level data. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 5 : Maximum likelihood probit estimates of primary school completion among 12 year old children, 1999-2000

Independent Variable	Parameter	Asym. t-ratio
Whether female*	**-0.041**	-3.52
Household head's schooling years	**0.006**	2.98
Schooling years of head's spouse	**0.005**	1.87
Schooling years of highest-educated adult male	**0.009**	4.33
Schooling years of highest-educated adult female	**0.012**	5.23
Whether household head female*	-0.165	-1.31
Whether child of head*	0.001	0.03
Whether rural resident*	-0.003	-0.2
Whether farm household*	**-0.021**	-1.57
Whether agricultural labor household*	-0.006	-0.42
Log of monthly per capita consumption expenditure	**0.041**	3.02
Log of annual government expenditure on elementary education per child 6-14 years	**0.067**	3.2
Whether Scheduled Tribe*	**-0.105**	-4.8
Whether Scheduled Caste*	**-0.074**	-4.87
Whether Other Backward Caste*	**-0.029**	-2.31
Whether Muslim*	**-0.128**	-7.72
Whether Christian*	0.027	0.66
Whether Sikh*	**-0.266**	-6.31
Whether female* x Number of cognizable kidnappings of women and girls per 100,000 population in district (1998) (x 1,000)	-16.779	-4.12
Percent of villages in district of residence that are connected by a pucca road (x 1,000)	**0.367**	1.72
Percent of population having access to electricity in district (x 1,000)	**0.829**	3.44
Number of primary (grades 1-5) schools per 1,000 children aged 6-11 in district (x 1,000)	1.101	0.62
Pupil teacher ratio in primary schools (grades 1-5) in district (x 1,000)	**-0.198**	-1.93
Ln gross domestic product per capita in state of residence	**0.218**	5.39
Number of observations	10,652	
Chi-squared statistic	1,265	
Log likelihood ratio	-6,493	
Pseudo R-squared	0.088	

Notes: Estimation employs unit record data from the 55th round of the National Sample Survey, merged with relevant district- and state-level data. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 6 : Maximum likelihood probit estimates of school attendance among 6-18 year olds, by sex, 1999-2000

	Equation (1)				Equation (2) (with variables having insignificant parameter estimates dropped)			
			Interacted with female dummy:				Interacted with female dummy:	
Independent Variable	Parameter	Asym. z-ratio	Parameter	Asym. z-ratio	Parameter	Asym. z-ratio	Parameter z-ratio	Asym. z-ratio
Age	**0.1660**	47.37	-0.0077	-1.50	**0.1587**	61.94		
Age squared	**-0.0087**	-59.93	-0.0001	-0.60	**-0.0086**	-79.89		
Whether child of head*	**0.1456**	15.38	**0.0542**	4.57	**0.1424**	15.00	**0.0693**	5.94
Whether rural resident*	**0.0442**	7.20	**-0.0678**	-7.70	**0.0452**	8.32	**-0.0670**	-8.09
Whether farm household*	0.0011	0.20	**-0.0197**	-2.55			**-0.0191**	-3.47
Whether agricultural labor household*	**-0.0569**	-10.23	**0.0209**	2.68	**-0.0586**	-12.44	**0.0234**	3.26
Log of monthly per capita consumption expenditure	**0.1383**	26.49	**-0.0209**	-2.79	**0.1474**	28.68	**-0.0405**	-5.63
Log of annual government expenditure on elementary & secondary education per child 6-18 years	**0.0349**	2.76	0.0258	1.43	**0.0437**	6.26		
Ratio of government expenditure on secondary education to that on elementary and secondary education	**0.0022**	8.12	**0.0026**	6.76	**0.0023**	10.45	**0.0023**	6.63
% population having access to electricity in district	**0.0011**	11.35	**0.0008**	5.64	**0.0011**	13.47	**0.0007**	5.38
% villages in district of residence that are connected by a pucca road	**0.0010**	10.95	**-0.0007**	-5.36	**0.0010**	11.21	**-0.0007**	-5.39
Schooling years of highest-educated adult male	**0.0236**	45.70	0.0003	0.40	**0.0236**	63.86		
Schooling years of highest-educated adult female	**0.0129**	18.36	**0.0107**	10.75	**0.0134**	19.95	**0.0093**	10.46
Number of elementary and secondary schools per 1,000 children aged 6-18 in district	**0.0052**	3.82	**0.0071**	3.60	**0.0058**	4.50	**0.0062**	3.49
Pupil teacher ratio in elementary and secondary schools in district	**-0.0010**	-4.13	0.0003	0.84	**-0.0008**	-4.76		
Number of cognizable kidnappings of women and girls per 100,000 population in district (1998)	-0.0007	-0.70	**-0.0061**	-4.81			**-0.0063**	-7.97
Whether Scheduled Tribe*	**-0.1311**	-16.17	0.0018	0.16	**-0.1297**	-22.34		
Whether Scheduled Caste*	**-0.0402**	-6.70	**-0.0323**	-3.71	**-0.0400**	-7.03	**-0.0318**	-4.08
Whether Other Backward Caste*	**-0.0283**	-5.55	**-0.0336**	-4.53	**-0.0281**	-5.80	**-0.0330**	-5.02
Whether Muslim*	**-0.1221**	-19.02	**0.0319**	3.72	**-0.1250**	-19.88	**0.0356**	4.35

Annex Table 6 (Contd.) : Maximum likelihood probit estimates of school attendance among 6-18 year olds, by sex, 1999-2000

Independent Variable	Equation (1)				Equation (2) (with variables having insignificant parameter estimates dropped)			
			Interacted with female dummy:				Interacted with female dummy:	
	Parameter	Asym. z-ratio	Parameter z-ratio	Asym. z-ratio	Parameter z-ratio	Asym. z-ratio	Parameter z-ratio	Asym. z-ratio
Whether Christian*	0.0153	0.93	**0.0419**	1.80			**0.0561**	.41
Whether Sikh*	**-0.1516**	-9.03	**0.0471**	2.19	**-0.1571**	-9.34	0.0551	.62
Whether female*	**0.5471**	3.31			**0.5008**	3.99		
Ln gross domestic product per capita in state of residence	0.0151	0.53	**-0.1336**	-3.26			**-0.0913**	.02
Number of observations	139,951				139,951			
Chi-squared test	47,216				47,103			
Log-likelihood ratio test	-65,433				-65,535			
Pseudo R-squared	0.2651				0.2640			

Notes: Estimation employs unit record data from the 55th round of the National Sample Survey, merged with relevant district- and state-level data. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 7 : Maximum likelihood probit estimates of the probability of a household being calorie deficient, 1999-2000

Independent Variable	Parameter	Asym. z-ratio
Schooling years of highest-educated adult male	**-0.0065**	-14.46
Schooling years of highest-educated adult female	**-0.0076**	-14.74
Whether household head female*	**-0.0473**	-5.37
Whether rural resident*	**-0.0509**	-9.68
Whether farm household*	**-0.0514**	-9.25
Whether agricultural labor household*	**0.0528**	10.48
Whether Scheduled Tribe*	**0.0346**	5.04
Whether Scheduled Caste*	**-0.0168**	-3.16
Whether Other Backward Caste*	**-0.0809**	-18.88
Whether Muslim*	**0.0324**	5.50
Whether Christian*	0.0134	1.19
Whether Sikh*	**-0.0440**	-2.77
Whether household has access to electricity*	0.0049	0.69
Whether household has access to electricity* x Whether poor state*	0.0123	1.55
% of households with access to safe drinking water in district	**0.0004**	3.62
% of households with access to safe drinking water in district x Whether poor state*	**-0.0006**	-5.22
Percent of villages in district of residence that are connected by pucca road	**-0.0013**	-11.15
Percent of villages in district of residence that are connected by pucca road x Whether poor state*	**-0.0011**	-8.18
Food grain production (kgs) per capita in district	**-0.0001**	-10.09
Food grain production (kgs) per capita in district x Whether poor state*	**-0.0002**	-6.61
% of cultivated land irrigated	**-0.0007**	-8.91
% of cultivated land irrigated x Whether poor state*	**-0.0004**	-3.73
Acres of cultivated land	**-0.0238**	-17.04
Log of mean monthly per capita consumption expenditure in district	**-0.2596**	-33.28
Number of observations	92,334	
Chi-squared statistic	7,505	
Log likelihood ratio	-60,186	

Notes: Estimation employs unit record data from the 55th round of the National Sample Survey, merged with relevant district- and state-level data. Calorie deficiency is defined as average calorie intake per person per day in a household being less than average daily calorie requirements per person, with the latter being estimated on the basis of individual occupation. Standard errors are corrected for heteroscedasticity using the Huber-white method. All coefficients are expressed as marginal effects (i.e., the change in probability of being underweight with a one-unit change in the right-side variable.) An "*" implies the variable is dichotomous. **Figures in bold indicate statistically significance of the marginal effect at the 10% or lower level.**

Annex Table 8 : Data on various MD indicators in the early and late 1990s, by region

NSS Region ID	Region	State	Infant mortality rate		% of children 0-35 months who are underweight		% of one-year olds immunized against measles		% of children aged 6-11 years attending school	
			1991	1997-99	1992-93	1998-99	1992-93	1998-99	1993-94	1999-2000
21	Coastal	Andhra Pradesh	56	72	44.84	32.63	55.90	70.75	73.42	85.00
22	Inland Northern	Andhra Pradesh	50	73	43.46	36.26	54.05	63.63	70.86	83.68
23	South Western	Andhra Pradesh	69	83	56.20	49.76	54.76	54.96	67.72	75.74
24	Inland Southern	Andhra Pradesh	53	72	54.21	44.07	45.16	69.67	76.14	88.91
31	Arunachal Pradesh	Arunachal Pradesh			38.41	24.34	28.57	34.96	66.94	58.24
41	Plains Eastern	Assam	83	83	49.55	28.65	29.30	24.40	80.69	83.21
42	Plains Western	Assam	98	77	48.02	42.76	23.40	26.77	79.21	78.61
43	Hills	Assam			45.83	10.94	28.57	17.31	89.90	83.10
51	Jharkhand	Jharkhand	69	67	47.52	54.37	14.66	18.89	55.96	57.74
52	Northern	Bihar	76	67	65.88	52.24	15.71	17.62	47.79	52.27
53	Central	Bihar	72	74	59.84	57.43	14.11	16.04	64.91	51.88
61	Goa	Goa			32.65	26.35	78.34	86.54	89.21	90.78
71	Eastern	Gujarat	73	68	42.20	44.01	65.22	70.65	75.31	80.64
72	Plains Northern	Gujarat	78	80	51.54	49.99	65.22	60.08	85.93	84.12
73	Plains Southern	Gujarat	49	68	59.32	50.60	57.14	59.42	81.49	87.21
74	Dry areas	Gujarat	89	77	54.14	43.83	43.27	62.20	77.12	77.70
75	Saurashtra	Gujarat	57	54	39.64	42.79	52.29	60.41	79.30	91.11
81	Eastern	Haryana	60	71	32.86	33.68	61.57	79.04	82.09	85.31
82	Western	Haryana	54	71	38.65	33.10	59.79	59.52	82.32	88.19
91	Himachal Pradesh	Himachal Pradesh	96	62	42.65	36.69	72.59	78.03	93.12	97.64
101	Mountainous	Jammu & Kashmir							92.17	90.75
102	Outer Hills	Jammu & Kashmir							71.81	75.78

Annex Table 8 (Contd.) : Data on [illegible] and late 1990s [illegible]

NSS Region ID	Region	State	Infant mortality rate		% of children 0-35 months who are underweight		% of one-year olds immunized against measles		% of children aged 6-11 years attending school	
			1991	1997-99	1992-93	1998-99	1992-93	1998-99	1993-94	1999-2000
103	Jhelam Valley	Jammu & Kashmir							100.00	85.48
111	Coastal and Ghata	Karnataka	35	39	52.75	24.49	48.72	80.91	89.54	97.13
112	Inland Eastern	Karnataka	61	49	48.91	33.43	73.17	88.22	93.54	93.28
113	Inland Southern	Karnataka	56	77	47.53	35.14	55.38	81.77	87.17	89.00
114	Inland Northern	Karnataka	64	74	52.99	54.75	53.64	54.98	70.11	75.41
121	Northern	Kerala	35	19	26.51	31.72	55.84	80.61	96.49	92.17
122	Southern	Kerala	33	8	25.36	18.30	74.78	94.74	95.88	98.04
131	Chhattisgarh	Chhattisgarh	103	93	61.41	59.66	44.03	41.11	69.09	77.79
132	Vindhya	Madhya Pradesh	136	117	48.88	54.23	34.26	20.96	57.35	69.74
133	Central	Madhya Pradesh	127	114	60.25	50.20	33.92	40.49	58.68	82.29
134	Malwa	Madhya Pradesh	100	94	60.74	47.57	49.81	41.02	63.83	68.38
135	South	Madhya Pradesh	123	100	62.45	58.75	53.87	36.75	71.93	81.12
136	South Western	Madhya Pradesh	133	81	59.74	55.74	29.28	39.18	68.08	61.38
137	Northern	Madhya Pradesh	114	98	51.89	54.32	42.46	33.20	58.74	74.34
141	Coastal	Maharashtra	52	41	42.11	45.39	75.42	85.59	92.14	92.72
142	Inland Western	Maharashtra	53	46	48.59	47.73	76.92	89.88	91.40	93.86
143	Inland Northern	Maharashtra	75	54		52.70		74.60	72.59	82.80
144	Inland Central	Maharashtra	62	71	52.99	52.15	65.18	80.53	83.08	89.93
145	Inland Eastern	Maharashtra	93	60	55.26	51.69	71.43	89.38	88.26	93.56
146	Eastern	Maharashtra	91	79		52.17		100.00	88.52	95.10
151	Plains	Manipur			23.66	25.30	43.62	53.69	94.76	90.38
152	Hills	Manipur			27.37	31.87	18.18	35.23	78.31	81.31

Annex Table 8 (Contd.) : Data on various MD indicators in the early and late 1990s, by region

NSS Region ID	Region	State	Infant mortality rate		% of children 0-35 months who are underweight		% of one-year olds immunized against measles		% of children aged 6-11 years attending school	
			1991	1997-99	1992-93	1998-99	1992-93	1998-99	1993-94	1999-2000
161	Meghalaya	Meghalaya			41.69	35.30	13.67	17.91	79.12	89.68
171	Mizoram	Mizoram			25.61	25.05	66.06	72.29	88.68	91.31
181	Nagaland	Nagaland			27.53	26.10	10.19	19.56	90.57	92.54
191	Coastal	Orissa	127	92	47.49	47.95	32.70	51.94	75.30	82.50
192	Southern	Orissa	123	125	41.44	54.12	45.47	47.45	52.31	53.40
193	Northern	Orissa	100	93	55.40	58.95	48.01	64.50	67.26	79.64
201	Northern	Punjab	61	52	44.04	25.74	71.27	78.43	89.52	92.19
202	Southern	Punjab	61	61	43.67	29.39	57.74	73.05	77.95	86.73
211	Western	Rajasthan	79	77	35.09	50.49	26.61	25.79	60.23	72.07
212	North Eastern	Rajasthan	84	94	52.52	46.10	31.39	35.26	66.54	78.96
213	Southern	Rajasthan	93	92	55.75	54.48	51.16	28.11	48.76	68.87
214	South Eastern	Rajasthan	90	88	60.00	55.98	37.68	27.63	56.23	80.03
221	Sikkim	Sikkim				20.00		60.48	91.36	95.05
231	Coastal Northern	Tamil Nadu	52	51	43.80	38.40	74.71	88.21	87.97	91.06
232	Coastal	Tamil Nadu	51	56	52.38	36.01	68.57	91.69	90.95	97.42
233	Southern	Tamil Nadu	56	53	41.61	32.05	68.18	91.90	88.99	94.12
234	Inland	Tamil Nadu	52	77	46.54	34.76	74.55	90.55	86.25	93.39
241	Tripura	Tripura			42.74	42.98	29.17	46.59	88.15	90.82
251	Uttaranchal	Uttaranchal	69	66	53.33	40.53	54.90	57.66	86.25	94.91
252	Western	Uttar Pradesh	94	97	55.02	48.62	23.12	31.80	66.39	74.03
253	Central	Uttar Pradesh	98	97	60.84	55.92	24.43	37.46	62.81	72.20
254	Eastern	Uttar Pradesh	93	82	55.96	48.88	28.28	37.57	62.38	73.82

Annex Table 8 (Contd.) : Data on various MD indicators

NSS Region ID	Region	State	Infant mortality rate		% of children 0-35 months who are underweight		% of one-year olds immunized against measles		% of children aged 6-11 years attending school	
			1991	1997-99	1992-93	1998-99	1992-93	1998-99	1993-94	1999-2000
255	Southern	Uttar Pradesh	102	78	48.14	54.47	30.95	27.00	58.47	78.64
261	Himalayan	West Bengal	82	60	42.92	41.18	51.82	50.08	70.82	80.20
262	Eastern Plains	West Bengal	84	62	60.47	51.00	36.20	43.12	61.62	71.35
263	Central Plains	West Bengal	61	46	51.92 4	0.81	45.15	62.85	78.26	81.10
264	Western Plains	West Bengal	68	60	62.17	55.54	39.32	56.24	71.39	81.44
271	Andaman & Nicobar Islands	Andaman & Nicobar							89.23	95.77
281	Chandigarh	Chandigarh							90.70	93.92
291	Dadra & Nagar Haveli	Dadra & Nagar Haveli							68.55	75.99
301	Daman & Diu	Daman & Diu							94.57	94.96
311	Delhi	Delhi			40.61	35.82	72.10	80.70	92.19	91.73
321	Lakshadweep	Lakshadweep							93.60	98.14
331	Pondicherry	Pondicherry							93.40	94.39

Annex Table 9 (Contd.) : Data on various MD indicators in the early and late 1990s, by region

NSS Region ID	Region	State	Net primary enrollment rate		Primary completion rate		% of population that is calorie-deficient		Ratio of girls to boys in primary and secondary school	
			1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000
21	Coastal	Andhra Pradesh	58.02	52.16	55.24	63.60	69.34	63.09	78.31	79.96
22	Inland Northern	Andhra Pradesh	45.51	57.49	66.09	65.65	67.81	68.13	81.58	73.86
23	South Western	Andhra Pradesh	49.05	63.83	67.54	60.52	60.40	70.62	74.95	76.92
24	Inland Southern	Andhra Pradesh	57.96	62.42	57.25	79.77	60.75	69.47	80.68	68.93
31	Arunachal Pradesh	Arunachal Pradesh	43.78	39.79	45.27	40.15	64.00	51.58	78.82	89.32
41	Plains Eastern	Assam	55.30	56.32	68.12	64.10	77.76	80.27	82.49	91.25
42	Plains Western	Assam	63.53	56.61	61.85	70.44	70.92	76.21	74.93	77.41
43	Hills	Assam	71.30	66.31	73.44	59.52	89.96	89.23	65.43	85.02
51	Jharkhand	Jharkhand	31.99	34.97	56.86	55.75	67.21	64.49	57.07	66.83
52	Northern	Bihar	22.23	26.19	52.62	40.55	62.74	59.22	49.75	55.88
53	Central	Bihar	33.80	26.98	65.57	52.08	57.07	45.71	54.22	50.27
61	Goa	Goa	47.54	63.25	83.29	83.07	69.31	65.59	93.16	71.06
71	Eastern	Gujarat	58.50	62.16	48.61	71.33	81.31	72.12	71.78	84.09
72	Plains Northern	Gujarat	58.23	62.87	59.97	77.78	61.99	66.46	81.63	78.33
73	Plains Southern	Gujarat	58.40	61.02	69.79	86.59	69.62	75.38	75.92	78.16
74	Dry areas	Gujarat	50.59	45.48	39.05	53.23	59.53	47.92	71.29	53.80
75	Saurashtra	Gujarat	56.42	58.62	67.22	48.14	51.85	51.42	78.77	77.63
81	Eastern	Haryana	48.41	58.06	53.13	55.18	45.21	48.50	74.33	75.82
82	Western	Haryana	48.76	53.65	64.77	54.72	34.86	42.84	64.59	79.57
91	Himachal Pradesh	Himachal Pradesh	73.00	67.94	64.01	69.30	50.75	41.56	89.98	91.29
101	Mountainous	Jammu & Kashmir	56.81	45.71	63.66	66.71	30.20	35.13	77.54	90.16
102	Outer Hills	Jammu & Kashmir	64.58	61.08	46.47	57.04	21.53	18.87	63.13	60.05

Annex Table 9 (Contd.) : Data on various MD indicators in the early and late 1990s by region

NSS Region ID	Region	State	Net primary enrollment rate		Primary completion rate		% of population that is calorie-deficient		Ratio of girls to boys in primary and secondary school	
			1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000
103	Jhelam Valley	Jammu & Kashmir		65.94		71.12		35.65		66.74
111	Coastal and Ghata	Karnataka	79.35	75.49	60.88	65.31	59.76	60.94	87.52	87.45
112	Inland Eastern	Karnataka	68.59	53.53	57.00	72.16	48.24	62.35	94.15	84.00
113	Inland Southern	Karnataka	60.72	58.12	82.86	79.32	63.94	54.48	96.29	97.90
114	Inland Northern	Karnataka	51.19	49.39	76.42	73.84	70.84	61.61	76.95	83.81
121	Northern	Kerala	63.17	61.09	92.10	85.08	69.58	61.49	94.04	93.27
122	Southern	Kerala	56.07	60.00	95.39	94.35	60.43	48.41	103.59	95.22
131	Chhattisgarh	Chhattisgarh	46.77	68.46	46.98	49.18	69.36	47.16	71.83	75.35
132	Vindhya	Madhya Pradesh	47.29	55.08	42.50	52.14	56.90	43.94	49.92	59.99
133	Central	Madhya Pradesh	32.59	49.64	68.10	48.18	73.44	56.91	64.02	69.08
134	Malwa	Madhya Pradesh	35.97	29.14	60.01	43.39	60.23	57.56	66.39	70.34
135	South	Madhya Pradesh	61.87	62.39	51.34	48.36	69.46	62.00	68.69	74.90
136	South Western	Madhya Pradesh	60.02	51.65	50.39	42.45	80.44	66.86	73.54	71.14
137	Northern	Madhya Pradesh	24.26	52.69	67.13	51.99	42.61	41.80	46.21	56.80
141	Coastal	Maharashtra	58.04	58.61	71.85	80.08	62.85	66.02	88.39	86.00
142	Inland Western	Maharashtra	50.43	55.36	66.97	76.35	73.64	62.45	83.30	83.39
143	Inland Northern	Maharashtra	40.03	61.12	83.42	79.27	78.44	62.96	81.04	78.19
144	Inland Central	Maharashtra	61.13	55.02	68.56	86.11	72.91	42.32	81.39	76.42
145	Inland Eastern	Maharashtra	58.00	58.30	71.28	83.18	74.02	60.34	77.26	76.58
146	Eastern	Maharashtra	64.72	64.69	84.85	87.71	75.09	61.50	90.23	90.32
151	Plains	Manipur	47.02	39.43	51.95	63.20	54.64	38.39	101.14	88.02
152	Hills	Manipur	43.44	50.57	69.21	42.20	65.96	53.66	89.99	76.66

Annex Table 9 (Contd.) : Data on various MD indicators in the early and late 1990s, by region

NSS Region ID	Region	State	Net primary enrollment rate		Primary completion rate		% of population that is calorie-deficient		Ratio of girls to boys in primary and secondary school	
			1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000
161	Meghalaya	Meghalaya	49.17	58.22	64.96	40.25	80.78	74.72	93.82	104.01
171	Mizoram	Mizoram	52.99	71.38	58.07	69.94	66.29	46.17	90.73	93.27
181	Nagaland	Nagaland	53.66	54.27	77.88	66.76	53.06	42.08	79.50	73.04
191	Coastal	Orissa	31.62	57.57	50.03	61.04	55.15	39.81	76.54	83.06
192	Southern	Orissa	19.59	25.64	36.91	35.57	70.79	62.92	70.08	73.35
193	Northern	Orissa	34.36	54.80	60.64	61.19	54.01	47.98	81.13	79.34
201	Northern	Punjab	60.61	57.23	62.07	64.57	47.61	44.99	88.57	89.43
202	Southern	Punjab	40.09	44.93	53.21	57.33	45.39	45.33	74.19	78.79
211	Western	Rajasthan	37.94	54.83	42.40	37.49	34.57	20.16	41.73	56.14
212	North Eastern	Rajasthan	44.08	58.49	44.13	53.53	31.80	28.41	42.07	52.53
213	Southern	Rajasthan	38.40	41.13	68.44	43.62	69.18	47.44	51.09	47.98
214	South Eastern	Rajasthan	43.03	60.72	33.59	45.65	58.24	43.18	59.85	73.56
221	Sikkim	Sikkim	55.58	66.14	44.35	31.57	81.65	69.99	87.21	91.44
231	Coastal Northern	Tamil Nadu	59.71	63.28	69.09	76.96	66.21	64.24	86.78	93.23
232	Coastal	Tamil Nadu	69.63	71.42	75.82	80.29	60.24	46.06	96.31	84.88
233	Southern	Tamil Nadu	71.67	65.42	76.96	78.36	73.29	62.25	90.85	75.32
234	Inland	Tamil Nadu	65.42	68.10	65.26	73.72	65.17	66.28	85.80	79.24
241	Tripura	Tripura	70.07	68.27	52.83	37.25	71.92	65.03	82.20	68.79
251	Uttaranchal	Uttaranchal	72.80	72.41	56.94	64.87	55.54	29.57	78.33	85.92
252	Western	Uttar Pradesh	51.28	53.02	50.38	48.18	45.33	36.45	55.00	66.64
253	Central	Uttar Pradesh	42.71	43.50	50.50	53.98	51.90	38.05	63.17	69.47
254	Eastern	Uttar Pradesh	44.21	59.06	51.80	47.62	56.97	40.27	55.51	64.33

Annex Table 9 (Contd.) : Data on various MD indicators in the early and late 1990s, by region

NSS Region ID	Region	State	Net primary enrollment rate		Primary completion rate		% of population that is calorie-deficient		Ratio of girls to boys in primary and secondary school	
			1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000	1993-94	1999-2000
255	Southern	Uttar Pradesh	46.74	46.50	61.42	44.71	47.51	31.25	51.26	60.34
261	Himalayan	West Bengal	53.84	59.23	51.08	48.67	64.92	58.19	78.44	79.66
262	Eastern Plains	West Bengal	42.52	46.58	55.37	48.67	55.68	60.79	79.50	85.79
263	Central Plains	West Bengal	52.35	55.46	49.43	57.21	54.19	58.41	85.62	81.26
264	Western Plains	West Bengal	56.39	52.28	42.28	64.94	55.23	59.43	74.57	75.58
271	Andaman & Nicobar Islands	Andaman & Nicobar Islands	76.11	75.58	66.62	79.54	39.18	59.25	96.70	86.70
281	Chandigarh	Chandigarh	43.96	68.86	51.15	88.90	35.55	40.60	123.86	86.99
291	Dadra & Nagar Haveli	Dadra & Nagar Haveli	57.96	56.44	72.30	62.43	86.72	57.57	58.25	90.74
301	Daman & Diu	Daman & Diu	55.47	73.08	89.61	77.91	58.41	42.49	100.20	93.11
311	Delhi	Delhi	55.45	47.75	65.00	50.18	41.33	58.65	78.28	92.02
321	Lakshadweep	Lakshadweep	58.56	72.89	81.23	83.02	13.07	21.14	118.98	90.32
331	Pondicherry	Pondicherry	66.12	63.53	93.05	67.01	54.82	50.14	90.42	100.44

Annex Table 10 : List of regions ranking among the lowest quartile of all regions in India on three or more of the five millennium development indicators considered in this report, 1998-2000

NSS RegionID	Region	State	Number of indicators on which region ranks in lowest quartile
53	Central	Bihar	3
132	Vindhya	Madhya Pradesh	3
134	Malwa	Madhya Pradesh	3
135	South	Madhya Pradesh	3
137	Northern	Madhya Pradesh	3
214	South Eastern	Rajasthan	3
241	Tripura	Tripura	3
252	Western	Uttar Pradesh	3
254	Eastern	Uttar Pradesh	3
255	Southern	Uttar Pradesh	3
51	Jharkhand	Jharkhand	4
52	Northern	Bihar	4
133	Central	Madhya Pradesh	4
192	Southern	Orissa	4
253	Central	Uttar Pradesh	4
255	Southern	Uttar Pradesh	4
136	South Western	Madhya Pradesh	5
213	Southern	Rajasthan	5

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Attaining the Millennium Development Goals in India

Reducing Infant Mortality, Child Malnutrition, Gender Disparities and Hunger-Poverty and Increasing School Enrollment and Completion

India has committed to attaining the Millennium Development Goals (MDGs) by the year 2015. The MDGs are a set of numerical and time-bound targets related to key achievements in human development launched at the Millennium Summit 2000. In the developmental context, they constitute the most widely-accepted yardstick of efforts made and policies implemented by governments, donors, and non-governmental organizations. Attaining the MDGs is imperative and especially so for a developing country such as India.

Significant among these goals are:

- Halving of the child underweight rate (from its level in 1990)
- Halving the proportion of people who suffer from hunger
- Two-thirds reduction in infant mortality rates
- Universal primary schooling
- Complete elimination of gender disparities in schooling opportunities.

How likely is India to reach these targets? And what will it take—by way of policy interventions—to attain the goals?

This report critically analyzes India's performance across five selected MDGs. It uses a variety of data sources to analyze past progress in social indicators, paying particular attention to the heterogeneity of progress across India's many states and sub-units. It establishes correlations between the millennium development outcomes and various policy interventions, and proceeds to project the likely evolution of the millennium development indicators through 2015 based on particular policy scenarios.

The report concludes by assessing the prospects of India as a whole—above all its poorer states—attaining the five MDGs by 2015. In doing so, the report highlights the type and scale of interventions that will be needed to attain these goals. This first of a kind presentation of data and analysis will be essential for policy-makers, scholars, and researchers in the fields of development studies, health, economics, and politics, as also for activists in organizations as they prepare to understand and confront the MDG challenges facing India.

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